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An Economic Study of the Production of Canning Crops in New York

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL OF CORNELL UNIVERSITY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

BY

LAURENCE JOSEPH NORTON

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L. J. Norton

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Cornell University
Agricultural Experiment Station
Ithaca, New York

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AN ECONOMIC STUDY OF THE PRODUCTION OF CANNING CROPS IN NEW YORK[1]

L. J. NORTON

The investigation described herein was conducted for two general purposes. The first was to obtain basic information regarding the production and cost of production of the principal crops grown in New York for canning factories. The second was to study some of the factors influencing the economical production of these crops.

METHODS OF INVESTIGATION

The data on cost of production were collected by the survey and the accounting method. In the survey method a number of the farmers growing the crop under consideration in some of the important centers of production were visited by representatives of the New York State College of Agriculture. Detailed information was obtained from each farmer concerning the methods practiced in growing the crop and the costs of production. A copy of one of the blanks used is shown on pages 79 to 82.

In the accounting method, farmers were furnished with blank account books with simple directions as to the records to be kept. In these books the farmers kept a record of all the items of expense incurred on the crop, of all receipts from the crop, and of the hours of human, horse, and tractor labor on the crop. At the end of the season the farmers were visited by a representative of the College of Agriculture, who checked the accounts and obtained the additional information necessary to calculate costs. This method does not entirely eliminate estimating. Such items as land values, rates of application of manure, and the cost of labor per hour, must be estimated. Since the results obtained by the survey method check closely with those obtained by the accounting method (tables 38 and 73, pages 40 and 66, respectively), all cost figures include data obtained by both methods unless otherwise stated.

COST OF PRODUCTION

The term *cost of production*, as used in this study, refers to the total expenses incurred directly or indirectly in the production of a crop. In addition to the actual cash outlays, it includes a return to the farmer for his labor, based on the outlay that would be necessary to hire a similar grade of labor, and a six-per-cent return on the investment in land, horses, and machinery used in producing the crop. Risk also should be included as an item of cost. In making comparisons between crops, consideration

[1] Also presented to the Faculty of the Graduate School of Cornell University, September, 1921, as a thesis in partial fulfillment of the requirements for the degree of doctor of philosophy.

AUTHOR'S ACKNOWLEDGMENT. The investigation was conducted under the direction of Professor G. F. Warren. It was made possible thru the cooperation of the New York State College of Agriculture with the New York Canning Crops Cooperative Association. New York growers of canning crops furnished the data on which the study was based. H. S. Mills, of the Department of Vegetable Gardening, assisted in obtaining and summarizing the data. To these and to many others who furnished valuable assistance, the writer is indebted.

should be given to the relative risks involved. In this study, risk has not been included as a separate item of cost on individual farms, but some allowance for risk has been made by including, in the averages, costs for all farms visited. Some of these farms had partial or complete crop failures.

The question of what items should be included in calculating the cost of any product raises certain difficulties. In agriculture the problem is complicated because on most farms a number of products are grown which are interrelated in a general system of farming, and because many enterprises yield two products—wheat and straw, corn and fodder, mutton and wool.

The problem is to obtain information by which one enterprise may be compared with another on the same farm, and the same enterprise may be compared on different farms. It is necessary, therefore, that uniform methods be employed. The methods used in this study have followed as closely as possible the principles laid down in the report of the committee appointed by the Secretary of Agriculture of the United States to make recommendations concerning methods of procedure in cost-of-production studies.[2]

ITEMS INCLUDED IN COST

Seed, plants, and fertilizer were charged at cost. All fertilizer applied in 1920 was charged to the crop of that year.

Manure was valued at the farmer's estimate, or, if no estimate was made, at $2 a ton at the barn. To allow for residual value, manure applied to the land that was in canning crops in 1920 was charged to the 1920 crop as follows: of the manure applied in 1920, 40 per cent; of the manure applied in 1919, 30 per cent; of the manure applied in 1918, 20 per cent; of the manure applied in 1917, 10 per cent.

Lime was charged at cost. The charge to the 1920 crop was based on the length of the rotation, the cost being distributed over the number of years in the rotation. In most cases 20 per cent of the cost of the applications made during the preceding five years to the land on which the 1920 crop was grown, was charged to the 1920 crop.

Labor hauling and spreading manure and lime. The time required to perform these operations was obtained separately. The crop was charged with the same percentage of the cost of labor as of the manure and lime involved. For example, if 40 per cent of the manure was charged to the crop, 40 per cent of the time spent in hauling and spreading it was charged also.

Hired labor was charged at cost. Where men were hired by the month, the total cost per month, including the value of board or privileges furnished, was divided by the estimated number of hours worked per month, in most cases 260.

Operator's and other family labor was charged at what the farmer estimated it would cost to hire labor of the same grade.

Horse labor was charged at 24.5 cents per hour on all farms except when teams were hired for special work, such as hauling peas. In such cases horse labor was charged at the price paid. The rate given was the preliminary average of the cost per hour of horse labor in 1919 on thirty-

[2] U. S. Agr. Dept., Circular 132 (Office of the Secretary), pages 9-15. 1919.

eight New York farms which cooperated with the New York State College of Agriculture in keeping complete cost accounts of their farm operations. This rate covers all the costs of keeping horses on these farms, among which are charges for interest on the average investment, for depreciation, for the use of buildings, for time spent in taking care of horses, and for the value of home-grown feeds fed to horses. The use of this uniform figure as the cost of horse labor on a particular farm is only approximately accurate, as this cost varies between farms; but it is more nearly accurate when used as the average cost on a group of farms.

Use of equipment was charged on all farms at 8.2 cents per hour of horse labor. This figure was the average cost on the cost-account farms for 1919. The reason for distributing equipment costs, which include machinery and harnesses, on the basis of the hours of horse labor, is that most farm machinery is drawn by horses and the cost varies approximately with the number of horses driven.

In 1920 the cost per hour of horse labor on thirty-three New York farms which kept cost accounts was 21.9 cents. The cost of equipment used on these farms was 9.5 cents per hour of horse labor. It will be noted that the horse-labor rate was lower than the rate used in this study, while the equipment rate was higher. The combined rate per hour for these two items was approximately one cent lower than the rate at which it was charged. The lower horse-labor rate was due to the reduction in the cost of feed during the latter part of the year. The higher equipment cost was due to the general increase in replacement and repair costs which continued in 1920.

Use of tractor, if hired, was charged at cost; if not hired, at $1.75 per hour. This figure was estimated, using as a basis the data obtained in a study of the costs of tractor operation for the year 1919.[3]

Use of automobile was charged at 10 cents per mile.

Use of trucks was charged at cost when hired, or, if not hired, at the rate that would be paid for similar trucks.

Interest was charged at 6 per cent per annum on all costs except the charge for use of land and that for seed and plants which were not paid for until the end of the season. Interest was computed from the average date when the costs were incurred, to the date of payment by the canning company.

Use of land. Where cash rent was paid for land, the rent paid per acre, plus taxes and other costs which the operator incurred, was used as the charge for use of land. The charge for use of land owned or worked on shares was calculated by multiplying the farmer's estimate of the value of the bare crop land by 8.2 per cent. The farm expenses chargeable to crop land in 1919 amounted to 8.2 per cent of the value of the crop land on the New York farms keeping cost accounts in that year. This rate included 6 per cent interest on the value of the land, taxes, and all other costs of upkeep. The crop-land costs in 1920 on thirty-three farms on which cost accounts were kept were 8.4 per cent of the value. This figure was not available when the costs were calculated. If the land was double-cropped, the canning crop was charged one-half the annual cost of use of land.

[3] Cornell University Agr. Exp. Sta., Bulletin 405. 1921.

Some of the methods used have been criticized at various times and by various persons as not being a correct basis of cost. The principal criticisms have been concerning the inclusion of a return for operator's labor and for interest on investment, particularly land; and the practices of charging home-grown supplies from one enterprise to another, and crediting by-products, at market value and not cost.

In considering these criticisms, the purpose for which the cost figures are to be used must be kept in mind. The primary uses of cost figures as here calculated are to compare different enterprises on the same farm, or the same enterprise on different farms or groups of farms, and as a basis for studying the relative efficiency of different methods of production. In order to be useful for these purposes, cost figures must include common elements. If on one farm the operator does all the work and on another all the labor is hired, unless the operator's time is included on the one, the two cannot be compared accurately. Similarly, in the case of land, if one farmer uses land valued at $50, and another land valued at $100, profitable comparisons cannot be made without including interest on the varying values. Land is often held to be different from other productive factors because its value is determined by the prices of its products and does not determine their prices. This is true, and the same is true of any other factor in production, varying only in the degree to which it can be put to other uses. The value of a factory having one use will depend, after it has been constructed, on the price at which its product can be sold. But if a factory that has more than one use is being studied to determine to what use it will be put, and if one product involves equipment costing $5000 while another involves equipment costing $10,000, unless returns on this capital are included in the comparison of costs such a comparison is of little value in determining which product should be manufactured.

The practices of charging home-grown supplies transferred from one enterprise to another, and crediting by-products at market value instead of at cost, are followed by most manufacturing enterprises having comparable problems when they desire to calculate the cost of a particular product. In order to compare the different enterprises on a farm, the returns must be comparable. If one farm raises oats for horse feed and another farm buys them, the costs of horse labor will not be comparable unless oats are in both cases charged at market value.

THE CANNING INDUSTRY

The canning industry in New York is based on a large volume of a variety of high-quality products. The climate and soil conditions prevailing in the canning sections of the State are such that a variety of fruits and vegetables can be economically produced.

Canning factories usually are located close to the land which produces the principal crops that are canned. Most of the factories in New York State pack a variety of products. In some cases the area in which the factory is located is not particularly well adapted to raising all the products that are canned, but the larger companies, operating a number of plants, have distributed them so that they have one or more plants located in a section well adapted to each crop.

Both fruits and vegetables are canned in the State, but in this investigation only the vegetable branch of the industry was considered. The leading vegetables canned are peas, corn, tomatoes, and string beans. Beets, cabbage in the form of sauerkraut, and spinach, are among the other vegetables canned.

Climatic and soil conditions determine the regions in which the raw products can be grown most advantageously. There are other factors also, however, which give relative advantages to various sections of the country. The most important of these is the location with reference to markets. New York State is located in the most densely populated part of the United States. In 1920 the combined population of the New England States and New York, New Jersey, Delaware, Maryland, and Pennsylvania, was nearly 30 per cent of the total population of the United States. The proportion of the total production of three of the leading kinds of canned goods in these States is given in table 1:

TABLE 1. POPULATION AND PROPORTIONAL PRODUCTION OF CANNED GOODS IN NEW ENGLAND, NEW YORK, NEW JERSEY, DELAWARE, MARYLAND, AND PENNSYLVANIA

	Per cent of United States total	
	1906 to 1910	1911 to 1920 ¶
Population	29.6*	29.8†
Peas‡	38.0	29.0
Corn‡	36.8	34.4
Tomatoes‡	60.6	56.2

*Population according to census of 1910.
†Population according to census of 1920.
‡The data in regard to the packs were obtained from the *Almanac of the Canning Industry*, published by the *Canning Trade*, Baltimore, Maryland.

The proportion of these three kinds of canned goods packed in these States was less in the period from 1911 to 1920 than in the earlier period, from 1906 to 1910. Measuring total consumption by total population, these States packed just about enough peas and corn to supply their needs and produced a surplus of canned tomatoes. Canners of corn and peas in the States listed have an advantage in having a near-by market for their product, while the tomato canners must ship a part of their pack to more distant markets.

The freight rates prevailing during the winter of 1920–21 from various producing centers to various large cities, and the estimated equivalent per ton of fresh tomatoes and green peas, are given in table 2.

If a canner of peas in Wisconsin and one in New York, respectively, located so as to have the freight rates shown in table 2, were shipping to New York City, the New York canner would have an advantage over the Wisconsin canner in freight rates on the canned goods amounting to about $15 per ton of shelled peas. When shipping to Pittsburg the New York canner would have an advantage amounting to about $6 per ton of shelled peas.

TABLE 2. FREIGHT RATES ON CANNED GOODS, AND EQUIVALENTS PER TON OF VEGETABLES

	Rates (carlot) per 100 pounds of canned goods	Equivalent per ton	
		Fresh tomatoes*	Green peas†
To New York from:			
Oconomowoc, Wisconsin	$0.70	.....	$28.00
Frankfort, Indiana	0.60	$ 7.20	.....
Rochester, New York	0.315	3.78	12.60
Woodstown, New Jersey	0.24	2.88	.....
Oakland, California‡	1.205	14.46	.....
To Chicago from:			
Oconomowoc, Wisconsin	$0.23	.....	$ 9.20
Frankfort, Indiana	0.24	$ 2.88	.....
Rochester, New York	0.44	5.28	17.60
Woodstown, New Jersey	0.64	7.68	.....
Oakland, California	1.205	14.46	.....
To Pittsburg from.			
Oconomowoc, Wisconsin	$0.44	.....	$17.60
Frankfort, Indiana	0.355	$ 4.26	.....
Rochester, New York	0.30	3.60	12.00
Woodstown, New Jersey	0.38	4.56	.....
Oakland, California	1.205	14.46	.....

* 2000 pounds of fresh tomatoes is considered equivalent to 1200 pounds of canned goods.
† 2000 pounds of green peas is considered equivalent to 4000 pounds of canned goods.
‡ The rates from California to New York City were actually less than those given above, because the rate by water from California to New York City was much lower than the rail rate. The ocean rate from the Pacific Coast to New York City was less than the rail rate from middle-western points to New York City.

Canning factories located in the more densely populated regions ordinarily would be expected to have to pay more to get their raw produce because of the higher prices for all kinds of agricultural products in those sections. So long as the consumption of the region exceeds the production, such factories are able to pay a higher price for the raw product because of the saving on freight. If production exceeds consumption, they will not be able to pay as high a price. However, if a surplus is produced continuously, it is very likely that the region has some special advantage in the growing of the crop which makes production possible at such a price as to enable the local canners to compete with canners with whom they are at a disadvantage as regards freight rates.

PRACTICES IN BUYING CANNING CROPS

Most of the crops grown for canning factories in New York State are raised under contract. Under the form of contract in common use in the State, the canner agrees to take the total product of a certain number of acres of a crop at a price fixed in the contract. These contracts are usually made in the late winter or early spring. The price to be paid, the price at which seed or plants are to be charged, the dates of payment,

certain conditions as to quality, and other terms of sale, are specified in the contract.

The canners in turn usually sell the canned goods, for delivery when they are packed, to wholesale grocers or other distributors. These are known as "futures." The quantity of "futures" of a given product which a canner sells is usually a certain proportion of a normal yield on the acreage for which he has contracted.

In other sections of the country, particularly in Maryland and Delaware, a considerable acreage of tomatoes not under contract is grown. In every community in these sections there are several buyers of tomatoes, and in the fall a competitive price is established. In the vicinity of Rochester and Buffalo in New York, there are market-gardening sections in which tomatoes are grown for the city markets. Some of these tomatoes may be sold to canners when the market conditions are not good. Such tomatoes, being surplus product from market gardens, can be sold at a lower price than tomatoes grown under contract, all of which have to be sold to a factory at a fixed price.

The part of their supply of vegetables which the companies grow on their own farms is, of course, not contracted for. Beans are the principal crop so grown. Farmers ordinarily do not have enough hired labor to grow and harvest this crop satisfactorily. The canning companies that raise beans employ a gang of laborers for hoeing and picking. When beans are grown under contract, the companies usually furnish the pickers.

Beets are usually not contracted for but are bought when they are ready to harvest. The price depends on the proportion of the various-sized beets. The greater the proportion of small-sized beets, the more they are worth for canning. Cabbage may be contracted for or bought at the market price in the fall. Spinach, unless grown on the canner's own farm, is usually bought from truck growers at the prevailing market price.

The local monopoly which the factory usually has makes it practically necessary that the price be set before the crop is planted, or at least that the method of arriving at a price be defined. There are advantages and disadvantages to the farmer in this method of sale. He is sure of the price, but he is in no way certain of the total returns he will receive. The profitable years, in the case of contract crops, are years when yields are good. When the yields of crops produced for the open market, such as cabbage and potatoes, are high, low prices usually prevail, but in years of low yields there is usually a compensating increase in the price. There is no such increase in the price of contract crops when the yields are low, and therefore such years are very unprofitable.

In order to secure a constant supply of any product, the price must be high enough to give to a sufficient number of producers returns comparable with what they may expect from other crops that work in equally well with their system of farming. Probably the return could be slightly less in the case of a crop the price of which is guaranteed than in the case of crops grown without a price guaranteed, because the uncertainties of price are eliminated. If data were available on the average costs and

returns from competing crops, the price necessary to maintain production of any crop could be ascertained with a fair degree of accuracy. The return per hour of human labor on the crop under consideration is probably the best measure of whether a price is adequate to maintain production. This should be equal to the returns from competing crops that fit in equally well with the system of farming. The return per hour should be based on the average yield and price over a series of years on the farms under consideration. In any particular year the crop may return either more or less per hour than the average.

PEAS FOR THE CANNING FACTORY

Peas for canning are grown chiefly in the States bordering the Great Lakes, where the climate is cool. Wisconsin and New York are the two leading States. The area in which peas are canned in New York extends from Oneida County, in the central part of the State, across the northwestern part to Lake Erie and the Niagara River. Peas are grown

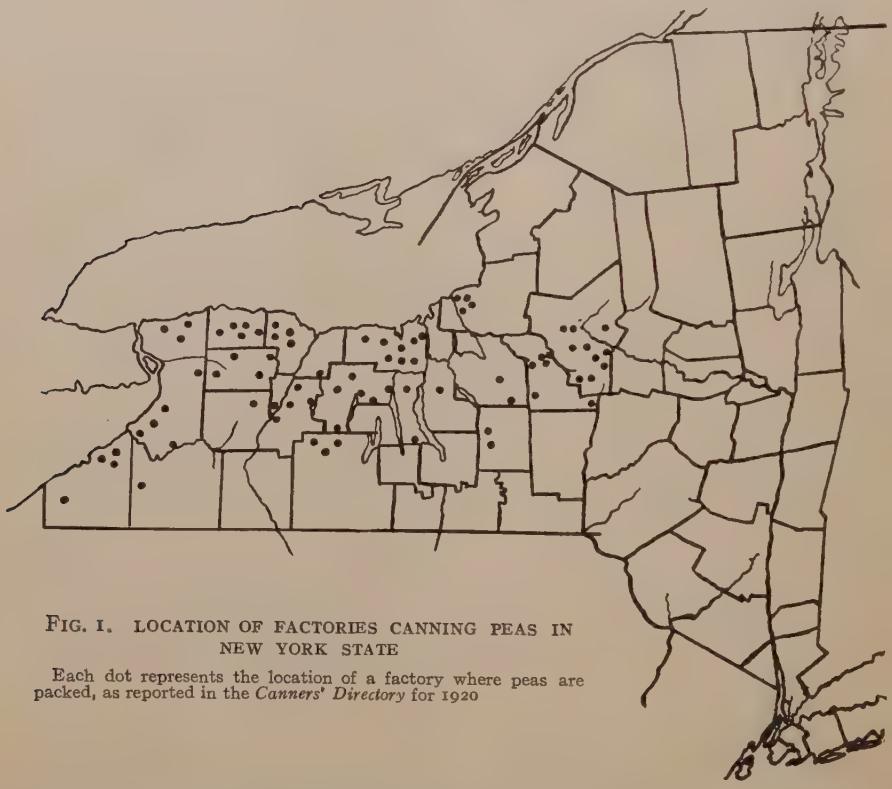

FIG. 1. LOCATION OF FACTORIES CANNING PEAS IN NEW YORK STATE

Each dot represents the location of a factory where peas are packed, as reported in the *Canners' Directory* for 1920

in many localities distributed thruout this section of the State, as is shown in figure 1. In most of the localities where peas are grown there is a considerable area of fairly deep, well-drained soil, usually well supplied with lime.

Cost data on the crop were obtained by both the account and survey methods. The location of the four areas in which surveys were made is shown in figure 2. The number of farms on which cost figures on peas were obtained by each method is shown in table 3.

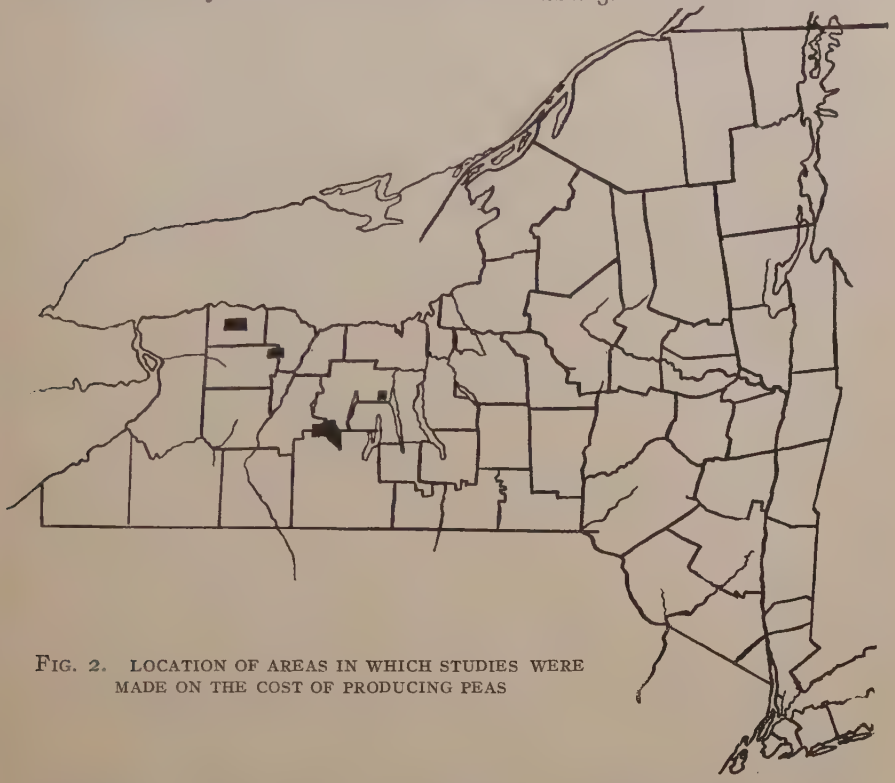

FIG. 2. LOCATION OF AREAS IN WHICH STUDIES WERE MADE ON THE COST OF PRODUCING PEAS

TABLE 3. FARMS ON WHICH COST FIGURES ON PEAS WERE OBTAINED IN 1920

Area	Accounts	Records	Total
Orleans	12	64	76
Genesee	5	43	48
Steuben	14	39	53
Ontario	1	49	50
Other counties	24	11	35
Total	56	206	262

AGRICULTURAL CONDITIONS IN THE AREAS STUDIED

Orleans area

The principal factory in Orleans County was located at Albion and was operated by the New York Canners, Inc. Peas were raised for this factory over the greater part of central Orleans County. The peas were

threshed at the factory, and at three outlying viner stations from which the shelled peas were hauled by motor trucks to the factory. These viner stations increased the territory from which the factory could procure peas, because the distance which peas can be hauled economically before being threshed is limited. The viner stations were located, in relation to the factory, 5 miles east, 7 miles north, and 8 miles west, respectively. There were several other smaller factories that packed peas in Orleans County.

There is no soil survey of Orleans County, but the soils on which peas are grown would probably be classed chiefly as Ontario loam, silt loam, and fine sandy loam, Lockport stony clay loam, and Dunkirk gravelly sandy loam. The land is, in general, level. This county is located in the Lake Ontario fruit belt, and in the section in which peas are grown, apples are the most important crop. Hay, winter wheat, oats, tomatoes, pears, and peaches are also important, and a great variety of other crops are grown (table 4).

TABLE 4. CROPS GROWN IN 1920 ON FARMS FOR WHICH COST DATA ON PEAS WERE OBTAINED

Crop	Acres per farm				Per cent of total crop acres			
	Orleans	Genesee	Steuben	Ontario	Orleans	Genesee	Steuben	Ontario
Peas	5.0	8.5	5.8	3.6	6.7	9.8	7.4	4.8
Beans	0.6	1.9	0.8	1.3	0.8	2.2	1.0	1.8
Cabbage	1.4	0.5	.....	4.2	1.9	0.6	.....	5.7
Corn for grain	3.4	4.4	2.2	6.6	4.6	5.1	2.8	8.8
Corn for silage	2.5	2.9	0.7	1.7	3.4	3.3	0.9	2.3
Sweet corn	1.4	1.0	0.9	0.9	1.9	1.2	1.1	1.3
Corn for fodder	.....	.....	0.1	.....	.....	.....	0.1	.....
Potatoes	1.9	2.6	9.1	1.7	2.5	3.0	11.9	2.3
Tomatoes	2.6	0.2	.....	.....	3.5	0.3	.....	.....
Oats	5.7	7.5	11.0	6.0	7.7	8.7	14.2	8.1
Barley	1.5	3.9	1.2	5.0	2.0	4.6	1.5	6.6
Oats and barley	0.4	.....	0.1	0.4	0.6	.....	0.2	0.5
Buckwheat	0.3	0.3	1.7	1.8	0.5	0.4	2.2	2.5
Winter wheat	14.3	25.1	5.7	14.6	19.3	28.9	7.4	19.4
Spring wheat	.....	.....	0.1	0.2	.....	.....	0.1	0.3
Rye	.....	.....	2.0	0.2	.....	.....	2.6	0.3
Hay	19.6	19.0	34.4	16.3	26.4	21.9	44.1	22.1
Alfalfa	0.7	5.8	0.6	1.5	0.9	6.7	0.8	2.0
Orchard, bearing	11.5	2.9	1.1	7.3	15.5	3.3	1.4	9.7
Orchard, not bearing	1.4	.....	.....	0.4	1.8	.....	.....	0.5
Other crops	.....	.....	0.2	0.9	.....	.....	0.3	1.0
Total crops	74.2	86.5	77.7	74.6	100.0	100.0	100.0	100.0
Total acres in farm	104.0	123.6	142.8	101.3	.....	.....	.....	.....

Genesee area

The farms included in the Genesee area are located in Genesee and Monroe Counties. The factory for which they raised peas was located at Bergen and was operated by the Curtice Brothers Company. All the peas were threshed at the factory because there was a sufficiently large acreage of land adapted to peas close enough to the factory to supply its requirements. The acreages grown per farm in this section were rather large, and all the farms that raised any considerable acreage had several varieties. Since the different varieties ripened at different dates, the time in which the peas could be harvested in condition suitable for canning was extended and it was possible for the farms to grow larger acreages.

The topography in this section is level to rolling. The soils on which peas were grown are for the most part Ontario loam and fine sandy loam. This is a general-farming section, in which wheat is the most important crop. Next to wheat and hay, more acres of peas were grown on these farms than any other crop (table 4).

Steuben area

The farms in the Steuben area are located in three counties — Steuben, Ontario, and Livingston. The parts of the three counties included in the area have more or less similar conditions. The Steuben Products Company operated four factories in this area, located respectively at Cohocton, Atlanta, and Wayland, in Steuben County, and Naples in Ontario County. A few outlying viner stations were operated.

The topography in this area is extremely varied. The farms may be divided into two classes, the hill and the valley. The valleys are nearly level, with steep banks on both sides. The tops of the hills are rolling. The soils in general are light, fairly deep, and not very well supplied with lime.

This is a very important potato-producing section. Twelve per cent of the land in crops on the farms visited was in potatoes in 1920. Other cultivated crops are not important. Peas were the second cash crop in importance (table 4). A considerable proportion of the land in this area is in pasture, woods, and waste. The farms are larger than in the other areas, but the acreage of crops grown per farm is about the same.

Ontario area

All the farms in the Ontario area are located in the eastern part of the county. The company for which the peas were raised, the Geneva Preserving Company, had a factory in the city of Geneva. Two viner stations were operated in the territory covered. The topography is level to rolling, and the soils are chiefly Ontario loam and fine sandy loam. Apples, cabbage, and wheat are important cash crops (table 4).

Peas were of less importance in this section than in any of the other areas. One of the viner stations was in a new location. Peas were a new crop to most of the farmers and no large acreages were grown. In the future, if the experience of other sections is repeated, some of the growers will probably drop out; others will put in larger acreages, and the acreage of peas per farm on the farms growing peas will be more comparable to that in the other areas.

Other counties

The farms which are designated as in " other counties " are located as follows: Niagara County, 2; Wayne County, 10; Ontario County, 6; Seneca County, 4; Cayuga County, 6; Onondaga County, 4; Madison County, 2; Cortland County, 1. On about 60 per cent of these farms, accounts were kept by farmers. These farms probably had higher yields per acre and lower costs per ton than the average of the farms in the sections in which they are located.

COST OF PRODUCTION

The average cost of producing an acre of peas in 1920 on the 262 farms in all areas in which data were obtained, is given in table 5, and the average cost in each area is given in table 6.

TABLE 5. AVERAGE COST OF PRODUCING AN ACRE OF PEAS ON 262 NEW YORK FARMS GROWING 1468 ACRES IN 1920

(Average yield per acre, 2246 pounds)

Item	Quantity per acre	Cost per acre	Per cent of total cost
Seed	4.0 bu.	$15.71	22.0
Fertilizer	164.0 lbs.	2.82	3.9
Manure charged to peas	2.8 tons	5.66	7.8
Lime charged to peas	52.0 lbs.	0.10	0.1
Labor growing peas:			
Human	15.8 hrs.	6.93	9.6
Horse	37.5 hrs.	9.18	12.7
Use of equipment	37.5 hrs.	3.07	4.3
Use of tractor	0.3 hr.	0.61	0.8
Use of automobile and truck		0.03	
Miscellaneous growing expenses		0.05	0.1
Interest on growing costs		0.61	0.8
Use of land		8.95	12.4
Total growing cost		$53.72	74.5
Labor harvesting peas:			
Human	21.8 hrs.	$9.10	12.6
Horse	26.2 hrs.	6.43	8.9
Use of equipment	26.2 hrs.	2.16	3.0
Use of automobile, truck, and tractor		0.17	0.2
Miscellaneous harvesting expenses		0.36	0.5
Interest on harvesting costs		0.20	0.3
Total harvesting cost		$18.42	25.5
Total cost of crop		$72.14	100.0
Value of ensilage		2.73	3.8
Net cost of shelled peas		$69.41	96.2
Shelled peas sold to factory	1.123 tons	$90.34	
Price received per ton		$80.44	
Cost per ton		$61.81	

Estimating average costs

The yield per acre in 1920 on these farms was somewhat higher than the average yield would be over a period of years. The average yield of canning-factory peas for the State during the past four years has been about 1800 pounds per acre. The yields in tons as reported by the United States Bureau of Crop Estimates were: 1917, 0.7 ton; 1918, 1.1 tons; 1919, 0.8 ton; 1920, 1.0 ton. The gains on a crop in years when the yield per acre is good must be sufficient to offset the losses in years when the yield is poor. The average cost of growing a ton of peas, and the average quantities of the materials necessary to produce a ton of peas if the yield is 1800 pounds per acre, can be estimated. The costs per acre up to harvest are independent of the fluctuation in yield. The most important factors causing variation in yield are the weather and any change in the

TABLE 6. AVERAGE COST OF PRODUCING AN ACRE OF PEAS IN 1920 IN DIFFERENT AREAS

Item	On 76 farms in the Orleans area growing 376.7 acres		On 48 farms in the Genesee area growing 406.5 acres		On 53 farms in the Steuben area growing 300 acres		On 50 farms in the Ontario area growing 179.6 acres		On 35 farms in the other counties growing 205.2 acres	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Seed	4.0 bu.	$15.98	4.0 bu.	$16.12	4.2 bu.	$14.63	4.1 bu.	$16.39	3.9 bu.	$15.42
Fertilizer	245.0 lbs.	4.05	80.0 lbs.	1.40	123.0 lbs.	2.31	207.0 lbs.	3.56	203.0 lbs.	3.51
Manure charged to peas	2.4 tons.	5.11	3.0 tons.	6.22	3.3 tons.	6.48	2.6 tons.	4.98	2.5 tons.	4.98
Lime charged to peas	35.0 lbs.	0.06	22.0 lbs.	0.03	155.0 lbs.	0.32	4.0 lbs.	0.01	31.0 lbs.	0.07
Labor growing peas:										
Human	17.2 hrs.	7.99	15.0 hrs.	7.19	16.3 hrs.	6.24	15.9 hrs.	6.61	14.2 hrs.	5.76
Horse	37.8 hrs.	9.25	41.7 hrs.	10.22	35.7 hrs.	8.74	34.3 hrs.	8.40	34.2 hrs.	8.39
Use of equipment	37.8 hrs.	3.10	41.7 hrs.	3.42	35.7 hrs.	2.93	34.3 hrs.	2.81	34.2 hrs.	2.81
Use of tractor	0.4 hr.	0.75	0.2 hr.	0.28	0.3 hr.	0.45	0.7 hr.	1.23	0.4 hr.	0.69
Use of automobile and truck		0.03		0.02		0.01		0.13		0.04
Miscellaneous growing expenses		0.07								0.18
Interest on growing costs		0.75		0.49		0.57		0.62		0.63
Use of land		9.14		9.25		7.73		9.75		9.13
Total growing cost		$56.28		$54.64		$50.41		$54.49		$51.61
Labor harvesting peas:										
Human	21.4 hrs.	$9.39	16.4 hrs.	$7.15	29.7 hrs.	$11.47	24.2 hrs.	$9.76	19.9 hrs.	$8.46
Horse	25.3 hrs.	6.20	22.3 hrs.	5.45	35.2 hrs.	8.63	28.1 hrs.	6.88	21.2 hrs.	5.19
Use of equipment	25.3 hrs.	2.08	22.3 hrs.	1.83	35.2 hrs.	2.89	28.1 hrs.	2.30	21.2 hrs.	1.74
Use of automobile, truck, and tractor		0.20		0.09		0.28		0.09		0.19
Miscellaneous harvesting expenses		0.03		0.76		0.65		0.05		0.02
Interest on harvesting costs		0.21		0.15		0.23		0.27		0.19
Total harvesting cost		$18.11		$15.44		$24.15		$19.35		$15.79
Total cost of crop		$74.39		$70.08		$74.56		$73.84		$67.40
Value of ensilage		4.76		0.13		2.89		1.94		4.63
Net cost of shelled peas		$69.63		$69.95		$71.67		$71.90		$62.77
Shelled peas sold to factory	0.986 ton.	$78.82	1.100 tons.	$87.07	1.317 tons.	$107.97	1.050 tons.	$87.31	1.204 tons.	$95.28
Price received per ton		$80.00		$79.15		$82.00		$83.15		$79.14
Cost per ton		$70.62		$63.59		$54.42		$68.48		$52.13

requirements of the factories regarding the time of harvest. The cost of harvesting will vary with the yield. Basing the calculation on these assumptions, the average cost per ton of shelled peas would have been $73.66 if the yield had been 1800 pounds per acre (table 7). This figure is very close to the cost in 1920 on a group of farms, the average yield of which was approximately 1800 pounds.

TABLE 7. ESTIMATED COST OF PRODUCING ONE TON OF PEAS IN 1920 WITH A YIELD OF 1800 POUNDS PER ACRE

(Based on data from 262 farms)

Cost of growing	$53.72 ÷ 0.9 (0.9 ton = 1800 pounds)	= $59.69
Cost of harvesting	$18.42 ÷ 1.123 (tons, average yield in 1920)	= $16.40
Total cost per ton of peas		$76.09
Value of ensilage	$2.73 ÷ 1.123 (tons)	= $2.43
Estimated net cost per ton of peas		$73.66

In table 8 are given the quantities of the principal items required to produce one ton of shelled peas with a yield of 1800 pounds per acre. The items of cost included in this table made up approximately 97 per cent of the total cost. Costs change with changes in price. By using the figures for the average quantities of the various items required to produce a crop, the cost with different prices may be estimated. These quantities were calculated by the method illustrated in table 7. The quantities of all items in the growing cost were divided by 0.9. This gave the quantity of these items required to grow one ton with an average yield of 1800 pounds. Similarly, the quantities of all items in harvesting costs were divided by 1.123. This gave the quantities of the items required to harvest one ton. Items which were included in both growing and harvesting costs, such as human and horse labor, were added together.

TABLE 8. ESTIMATED QUANTITIES OF THE PRINCIPAL ITEMS REQUIRED TO PRODUCE ONE TON OF PEAS IN 1920 WITH A YIELD OF 1800 POUNDS PER ACRE*

(Based on data from 262 farms)

Item	Quantity
Seed	4.5 bushels
Fertilizer	182.0 pounds
Manure	3.1 tons
Human labor	37.0 hours
Horse labor	65.0 hours
Use of equipment	65.0 hours
Use of land	1.1 acres

*The items included made up 97 per cent of the cost in 1920.

Seed

With the exception of human labor, seed was the largest single item in the cost of producing peas in 1920. The seed is supplied to the farmers by the canning companies. Very little of it is produced in New York State. The price of seed was higher in 1920 than the price which farmers paid the company. The difference is a part of the cost of raw product to the company. If seed cost $6 a bushel and was charged at $4, the additional cost per ton of shelled peas with a yield of 2000 pounds per acre would be $8. The canners call this item "seed loss" and recognize it as one of their costs.

This practice of not charging peas to the farmer at cost partially distributes the risk of loss in case of crop failure. Seed is not paid for when planted, but the cost is deducted from payment for the crop. In case of crop failure, the farmer usually stands the loss up to the amount at which the seed is charged to him. With seed at $4 a bushel and peas at 4 cents a pound, it required 400 pounds of shelled peas to pay for the seed. On only one of the 262 farms on which figures for the 1920 crop were obtained was the yield per acre less than 400 pounds. The seed loss per ton of peas harvested is greater in years when the average yield per acre is low than in years when the yield per acre is high, as the loss per acre is fixed.

The quantity of peas most commonly sown per acre was four bushels (table 9). In most sections the price of seed was $4 a bushel. In the Steuben area it was $3.50 a bushel. This difference in the price of seed made a difference of $2 per acre in the cost of producing peas.

TABLE 9. FARMS USING DIFFERENT QUANTITIES OF SEED PER ACRE, 262 FARMS, 1920

Bushels per acre	Number of farms					
	Orleans	Genesee	Steuben	Ontario	Other counties	Total
Less than 4	16	10	1	..	7	34
4	50	29	34	43	26	182
More than 4	10	9	18	7	2	46
Average	4.0	4.0	4.2	4.1	3.9	4.0

Fertilizer

Fertilizer was not a very large item in the cost of producing peas. The extent to which fertilizer was used is shown in table 10. The principal fertilizing material was some form of phosphorus. Practically half of all the fertilizer used was acid phosphate, and the balance was some kind of mixed fertilizer in which phosphorus was the principal constituent (table 11).

TABLE 10. USE OF FERTILIZER ON PEAS IN 1920

Area	Number of farms using fertilizer on peas	Per cent of farms using fertilizer on peas	Number of acres on which fertilizer was used	Per cent of land in peas which was fertilized	Average quantity of fertilizer used per acre fertilized (pounds)
Orleans	73	96	363.8	97	253
Genesee	20	42	145.0	36	223
Steuben	30	57	173.0	58	213
Ontario	47	94	147.8	82	251
Other counties	29	83	192.8	94	216
All farms	199	76	1,022.4	70	235

TABLE 11. KINDS AND QUANTITIES OF FERTILIZER USED ON THE 199 FARMS USING FERTILIZER ON PEAS IN 1920

Kind of fertilizer*	Number of farms using	Acres of peas on which used	Total pounds applied	Total cost	Per cent of total pounds
1–8–0	1	6.0	1,000	$ 17.50	0.4
1–8–1	2	9.2	1,840	32.37	0.8
1–8–2	17	82.2	19,500	381.68	8.1
1–8–3	2	7.0	1,400	33.60	0.6
1–8–4	4	15.0	3,350	72.08	1.4
1–9–0	1	6.0	1,000	17.50	0.4
1–9–3	2	3.5	618	14.22	0.3
1–10–0	14	64.5	14,570	248.57	6.1
1–10–1	4	17.0	3,650	70.10	1.5
1–10–2	2	13.5	2,700	53.00	1.1
1.5–10–0	2	36.0	9,000	155.21	3.7
2–8–0	1	4.0	1,200	26.40	0.5
2–8–1	1	3.0	600	13.50	0.2
2–8–2	12	56.2	12,800	277.08	5.3
2–8–3	10	28.5	6,450	144.27	2.7
2–8–4	5	14.0	6,050	157.25	2.5
2–8–5	2	8.0	2,300	56.10	1.0
2–8–10	1	2.5	500	16.25	0.2
2–10–0	31	128.5	26,532	506.01	11.0
2–10–2	1	3.0	750	16.69	0.3
2–12–0	3	15.0	3,000	61.99	1.2
3–8–0	1	5.0	1,250	23.12	0.5
3–8–5	1	9.5	2,100	63.00	0.9
0–10–2	1	5.0	750	12.75	0.3
0–12–3	1	2.5	800	15.20	0.3
Acid phosphate	87	477.8	116,487	1,657.77	48.7
Nitrate of soda	1	.....	25	1.10	.....
Total	210†	1,022.4	240,222	$4,144.31	100.0

* The numbers used to designate the kinds of fertilizer refer to the percentages of the three constituents, nitrogen, phosphoric acid, and potash, in the fertilizer: for example, a 1-8-2 fertilizer contains 1 per cent of nitrogen (N), 8 per cent of phosphoric acid (P_2O_5), and 2 per cent of potash (K_2O).

† Some of the 199 farms used more than one kind of fertilizer.

Manure

Three-fourths of the land on which peas were grown in 1920 had been manured during the years 1917 to 1920 (table 12). More manure had

TABLE 12. MANURE APPLIED FROM 1917 TO 1920, TO LAND IN PEAS IN 1920

Area	Acres of peas	Acres manured	Tons of manure applied	Tons charged to crop	Tons charged to crop per acre of peas
Orleans	376.7	257.4	3,249	900	2.4
Genesee	406.5	297.5	4,714	1,221	3.0
Steuben	300.0	232.8	3,429	992	3.3
Ontario	179.6	123.8	1,561	462	2.6
Other counties	205.2	162.4	2,073	521	2.5
All farms	1,468.0	1,073.9	15,026	4,096	2.8

been used in the Genesee and Steuben areas than in the other areas. In these two sections the smallest quantity of fertilizer was used per acre. The manure charged to peas was applied principally to the preceding crop (table 13). Eighty-two per cent of the applications charged to the pea crop were made directly to the peas or the preceding crop.

TABLE 13. APPLICATIONS OF MANURE, BY YEARS, TO LAND IN PEAS IN 1920

Year manure was applied	Total manure applied		Manure charged to crop	
	Tons	Per cent	Tons	Per cent
1920	1,830	12.2	731	17.8
1919	8,691	57.8	2,630	64.2
1918	2,881	19.2	573	14.0
1917	1,624	10.8	162	4.0
Total	15,026	100.0	4,096	100.0

Lime

Except in the Steuben area, lime had not been used extensively on land on which peas were grown. Of 209 farms outside of that area, only 11 had used lime during the years 1916 to 1920 on the land in peas in 1920. In the Steuben area, 19 out of 53 farms had used lime during that period on the land in peas in 1920. Except in this area the soils in the areas studied are, in general, naturally well supplied with lime.

Labor

The rates for the various classes of labor that performed the work on peas in 1920 varied somewhat (table 14). The rate at which the operators' labor was charged was 9 cents higher per hour than the rate for hired labor for the growing work, and 7 cents higher for the harvesting work.

The labor rates were lowest in the Steuben area and highest in the Orleans and Genesee areas.

TABLE 14. RATES PER HOUR FOR DIFFERENT CLASSES OF LABOR ON PEAS, 262 FARMS, 1920

Class of labor	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Growing:						
Operators	$0.49	$0.50	$0.41	$0.46	$0.46	$0.47
Sons over 16	0.47	0.49	0.39	0.36	0.30	0.42
Other family	0.37	0.30	.....	0.27	0.32	0.32
All family	0.48	0.49	0.41	0.44	0.44	0.46
Hired	0.41	0.43	0.33	0.36	0.38	0.39
Total growing	$0.46	$0.48	$0.38	$0.42	$0.42	$0.44
Harvesting:						
Operators	$0.48	$0.51	$0.42	$0.46	$0.46	$0.46
Sons over 16	0.43	0.49	0.40	0.36	0.37	0.42
Brothers	0.30	.....	.....	0.30	0.35	0.32
Fathers	0.48	0.34	0.29	0.46	.....	0.38
Other family	0.34	0.29	0.31	0.27	0.38	0.31
All family	0.45	0.45	0.41	0.42	0.44	0.43
Hired	0.41	0.40	0.36	0.37	0.42	0.39
Total harvesting	$0.44	$0.44	$0.39	$0.40	$0.43	$0.42

The proportion of the work performed by these different classes of labor is shown in table 15. Seventy-one per cent of the work on the crop

TABLE 15. PROPORTION OF WORK ON PEAS PERFORMED BY DIFFERENT CLASSES OF LABOR, 262 FARMS, 1920

Class of labor	Per cent of work done					
	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Growing:						
Operators	68	64	54	57	58	61
Sons over 16	4	10	12	10	5	8
Other family	1	3	.....	1	2	2
All family	73	77	66	68	65	71
Hired	27	23	34	32	35	29
Total growing	100	100	100	100	100	100
Harvesting:						
Operators	48	41	46	46	41	45
Sons over 16	6	9	7	12	6	7
Brothers	1	.....	.....	1	2	1
Fathers	1	4	1	1	.....	2
Other family	11	12	6	7	3	8
All family	67	66	60	67	52	63
Hired	33	34	40	33	48	37
Total harvesting	100	100	100	100	100	100

before harvest was done by the operator or some member of his family. A larger proportion of the harvesting labor was hired. A considerable amount of the harvesting labor was done by sons under sixteen years of age and by wives and daughters of the farmers. The nature of the pea crop requires that it be harvested quickly. At such times extra labor must be obtained, and if hired labor is not available the work must ordinarily be performed by members of the family. Labor was particularly scarce and high during the season of 1920. This fact may have made it necessary for a larger proportion of the labor than normal to be performed by the operators' wives and children.

Miscellaneous expenses

Soil inoculation, with cultures prepared by the College of Agriculture, was used on 12 farms. The purpose of this practice is to introduce into the soil the bacteria which enable the pea plant to utilize nitrogen from the air. In most of these cases it was being tested in cooperation with either the canning factory or the farm bureau.

When a grower belonged to a growers' association, dues and commissions paid to the association were considered as costs. In the Genesee area 1 per cent of the value of the peas, less the seed, was deducted by the canning company from payments made to association members, and paid to the association. In Steuben County 0.5 per cent of the value was similarly deducted and paid to the association.

Interest

The interest item, as explained on page 7, was calculated to the date when the peas were paid for. This varied with the different factories. Dates were on which payments were to be made specified in the contract. These dates were as follows: Orleans area, at the principal factory, on the 1st of the month for all peas hauled in before the 15th of the preceding month; Genesee area, one-half when the peas were drawn in, balance on October 1; Steuben and Ontario areas, one-half on August 15, balance on November 1. In all cases the amounts due the company for seed, labor, or ensilage were deducted from the first payment. The other companies paid at various dates. In some cases no payment was made until December 1. Interest was figured on the basis of the dates specified in the contracts, because when the costs were calculated the exact dates of payment, if different, were not known.

At least one company in the State paid interest on the unpaid balance from August 25 to the date of the final payment. Farmers can usually obtain the money in advance of the contract date by discounting at their bank a non-interest-bearing note which the company will give them. This practice amounts to their paying interest on the money they receive until the date the contract calls for payment. The longer the payment is delayed, the larger the item of interest becomes and the less advantage peas have as a crop on which the farmer can realize quick returns.

Use of land

The land values and the charges for the use of land on which peas were grown in the different areas are given in table 16. The land value was

highest in the Ontario area and lowest in the Steuben area. The variations in value are due to differences in the productivity of the soil, the character of the crops grown, the location relative to markets and towns, and other local conditions.

TABLE 16. VALUE PER ACRE AND CHARGES FOR USE OF LAND IN PEAS, 262 FARMS, 1920

Area	Value per acre*	Charges per acre			
		Land owned	Land share-rented	Land cash-rented	All farms
Orleans	$115	$10.01	$ 8.65	$ 6.63	$ 9.31
Genesee	114	9.66	8.42	8.07	9.25
Steuben	93	8.20	6.40	15.00	7.73
Ontario	128	10.64	10.17	8.29	10.42
Other counties	121	10.00	10.11	.....	10.00
All farms	$112	$9.62	$8.27	$8.16	$9.18

* Includes only value of land owned or worked on shares.

On a few farms a second crop was grown after the pea crop was harvested. This was most common in the Ontario area. Buckwheat, the principal crop so grown, was grown on 15 farms after 48 acres of peas. Fodder corn was grown on 2 farms after 13 acres of peas. The land was prepared for the buckwheat or the corn by disking without plowing. This practice was followed only after the early varieties of peas — Alaska and Surprise. When the land was so double-cropped, the peas were charged one-half the land cost.

The proportion of the peas grown under different tenures is shown in table 17. In calculating costs no division was made between tenant and landlord. Usually the returns from shelled peas and the expenses for seed and fertilizer are divided equally; the tenant pays all the cash cost of human labor, and the landlord all the land costs; the horse and equipment costs are divided in varying proportions between the two. Considering the pea crop alone, more than half of the costs are ordinarily borne by the tenant.

TABLE 17. PROPORTION OF ACRES OF PEAS GROWN UNDER DIFFERENT TENURES, 1920

Tenure	Per cent of acres of peas grown					
	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Owned	57	68	66	69	92	68
Worked on shares	37	26	32	26	8	28
Cash-rented	6	6	2	5	.....	4
Total	100	100	100	100	100	100

RETURNS

Prices paid

In 1920 the price received was nearly uniform in the different sections. This was due in part to the activities of the growers' associations, which attempted to secure a uniform price. The prices paid per ton in the various areas were as follows: Orleans, $80 for all varieties; Genesee, $82.50 for the early varieties, and $77.50 for the late varieties except Prince of Wales, for which $82.50 was paid; Steuben, $82 for all varieties; Ontario, a variable price depending on the proportion of peas of different sizes.

Buying on a graded basis

The time when peas are harvested has much to do with the profits of both the farmer and the canner. The interest of both is to get as much money out of the crop as possible. This can be accomplished most satisfactorily to both parties by cutting the peas at as late a date as will permit their being in the tender condition necessary for high quality in the canned product. The companies usually employ "road men" to watch the peas of the different growers and order them cut when they are at the proper stage. The better and more experienced road men aim to have the peas cut at a stage when the yield will be good but the peas will still be in good condition for canning. With favorable weather they are usually successful in this.

Most of the canning companies pay a flat price per ton for peas. Sometimes the contracts call for two prices — one for fancy and one for standard peas. If the peas are cut when ordered by the company's road men, they are usually paid for as fancy peas. A few companies pay for peas according to the proportion of the different sizes. One of these is the company operating in the Ontario area. After the peas are threshed, a sample of them is mechanically graded according to size. The number of pounds of each size in 100 pounds of peas, and the price per hundred of the load, are then calculated. The prices paid in 1920 at this plant were as follows:

Alaska variety

1. 10 cents a pound for peas that went thru a 18/64-inch mesh
2. 8 cents a pound for peas that went thru a 20/64-inch mesh
3. 3 cents a pound for peas that went thru a 22/64-inch mesh
4. 2 cents a pound for peas that would not go thru a 22/64-inch mesh

Sweet Wrinkled varieties

1. 10 cents a pound for peas that went thru a 20/64-inch mesh
2. 8 cents a pound for peas that went thru a 22/64-inch mesh
3. 3 cents a pound for peas that went thru a 24/64-inch mesh
4. 2 cents a pound for peas that would not go thru a 24/64-inch mesh

If when calculated on the above basis the average price per ton was not $81.25 for the entire crop of the Alaska variety, or $76.25 for the entire crop of the Sweet Wrinkled varieties, a minimum price of $81.25 per ton was paid for the former and $76.25 for the latter.

Whether this system is as satisfactory to the farmer as the payment of a flat price depends on the comparative yields and prices under the two

systems. The yields per acre for an early and a late variety in two sections in which other conditions were similar were as follows:

Variety	Graded basis	Flat price
Alaska	1,819 pounds	1,834 pounds
Advancer	2,389 pounds	2,440 pounds
Average of all varieties	2,099 pounds	2,197 pounds

The proportions of the different sizes among all the peas threshed at two viner stations in the Ontario area, with the resulting prices per ton, are given in table 18:

TABLE 18. PROPORTIONS OF PEAS OF DIFFERENT SIZES FOR DIFFERENT VARIETIES, PRICES PAID FOR EACH SIZE, AND CALCULATED VALUE PER TON, AT TWO VINER STATIONS IN THE ONTARIO AREA, 1920

Variety and size according to preceding schedule	Pounds of each size per 100 pounds of peas	Price per pound for this size	Value
Alaska variety			
Viner station No. 1			
Size 1	8.100	$0.10	$0.81000
Size 2	19.385	0.08	1.55080
Size 3	47.019	0.03	1.41057
Size 4	25.496	0.02	0.50992
	100.000	.....	$4.28129
Price per ton			$85.63
Viner station No. 2			
Size 1	6.491	$0.10	$0.64910
Size 2	18.408	0.08	1.47264
Size 3	49.453	0.03	1.48359
Size 4	25.648	0.02	0.51296
	100.000	.....	$4.11829
Price per ton			$82.37
Sweet Wrinkled varieties			
Viner station No. 1			
Size 1	8.439	$0.10	$0.84390
Size 2	13.407	0.08	1.07256
Size 3	26.771	0.03	0.80313
Size 4	51.383	0.02	1.02766
	100.000	.....	$3.74725
Price per ton			$74.94
Viner station No. 2			
Size 1	9.898	$0.10	$0.98980
Size 2	14.828	0.08	1.18624
Size 3	29.111	0.03	0.87333
Size 4	46.163	0.02	0.92326
	100.000	.....	$3.97263
Price per ton			$79.45

The prices per ton as calculated in table 18 are not the actual prices paid but are the prices that would have been paid if no minimum price per ton had been guaranteed. With a minimum price per ton guaranteed, the prices actually paid were higher. The average prices paid on the 50 farms in this section on which cost figures were obtained were as follows: Alaska variety, $86.34 per ton; Horsford Market Garden variety, $79.72 per ton; Advancer variety, $82.32 per ton. The larger proportion of large-sized peas in the Horsford Market Garden variety resulted in a lower average price per ton than for the Advancer variety.

The farms with the lower yields received higher average prices per ton (table 19). The higher prices received on the farms which had the lower average yields indicate that a larger proportion of the peas on these farms were of the smaller sizes. However, there were some farms in the higher-yielding groups which produced peas that graded well enough so that the price paid was higher than the guaranteed price. This was true of the farms that had good yields of the Alaska and Advancer varieties. Only one farmer out of ten having a yield of over 2500 pounds of the Horsford Market Garden variety received a premium, while seven farmers out of eleven that had yields of over 2500 pounds of the Advancer variety received higher than the guaranteed price. In order to have the same price per ton for these two varieties, a different scale of prices would be necessary.

TABLE 19. RELATION BETWEEN YIELD PER ACRE AND PRICE PER TON ON FARMS IN THE ONTARIO AREA, 1920

Yield per acre (pounds)	Acres	Average yield per acre (pounds)	Price per ton*	Number of farms	Number with price above guarantee
Alaska					
Less than 1500	22.9	1,190	$93.64	14	9
1500 to 2000	31.0	1,767	83.46	14	8
2001 to 2500	31.5	2,151	86.48	14	7
Over 2500	5.0	2,932	82.52	3	1
Total	90.4	1,819	$86.34	45	25
Advancer					
Less than 1800	6.5	1,284	$91.46	5	5
1800 to 2500	17.0	2,005	85.48	10	6
2501 to 3000	9.0	2,637	78.62	5	4
Over 3000	8.8	3,669	79.32	6	3
Total	41.3	2,389	$82.32	26	18
Horsford Market Garden					
Less than 1800	13.9	1,553	$84.78	9	7
1800 to 2500	12.5	2,007	85.06	8	6
2501 to 3000	7.0	2,579	73.96	5	1
Over 3000	11.5	3,453	76.22	5	0
Total	44.9	2,326	$79.72	27	14

* If the amounts paid as guarantees were not included in these returns, the differences in the price per ton between groups would be even greater.

Miscellaneous returns

The pea crop yields two products, peas and vines. The vines, after being threshed, usually are stacked. At a few factories they are put into silos. The outside of the stack rots, shutting out the air, and the interior becomes ensilage. This is usually sold back to the growers. The prices charged and the quantities allowed the growers vary considerably in the different areas. The ensilage is usually divided among the growers according to the acreage grown or the weight of shelled peas delivered. Ordinarily about two tons of ensilage are returned per acre. Frequently the owner of the land on which an outlying viner station is located receives, without cost or at a nominal sum, a considerable proportion of the ensilage. He usually grows a considerable acreage of peas.

In figuring the net cost of shelled peas, the estimated value of the vines above the charge made by the canner and the cost of hauling was deducted from the total cost of the crop. None of the regions included in the survey are important livestock regions, livestock being kept principally to utilize by-product roughage. The pea-vine ensilage is fed chiefly to dairy cattle and to sheep. In counties where dairying is more important, the ensilage would be a larger item of credit to the crop than in the areas included in this study. In dairy sections the green vines are often drawn home as they come from the viner, and fed to the stock. No charge is made for these ordinarily.

Factors affecting net returns

Other factors than price must be considered in comparing payments made by different companies. The more important of these are: (1) The price at which seed is charged. With a crop of 1800 pounds per acre, a change of $1 per bushel in the price of seed is equal to a change of about $4.50 per ton in the price of the peas. (2) The practice of the companies as to weighing. Some companies weigh the peas as they come from the viner without cleaning, others partly clean them, and others clean thoroly with a blower-cleaner before weighing. (3) The price at which the growers are allowed to purchase ensilage. If two tons of ensilage are

TABLE 20. NUMBER OF ACRES, AND YIELDS OF SHELLED PEAS PER ACRE, OF VARIETIES OF PEAS GROWN

Variety	On 76 farms in the Orleans area		On 48 farms in the Genesee area		On 53 farms in the Steuben area		On 50 farms in the Ontario area		On 262 farms in all regions
	Acres	Pounds per acre	Acres	Pounds per acre	Acres	Pounds per acre	Acres	Pounds per acre	Pounds per acre
Alaska	165.6	1,695	93.0	1,834	81.2	1,989	90.4	1,819	1,808
Surprise	4.5	1,676	31.0	1,623	4.0	1,803	.....	.....	1,671
Roger's No. 60	.....	.....	29.0	2,049	.....	.....	.....	.....	2,049
Admiral, green	127.2	2,342	67.5	2,820	48.3	2,992	.....	.....	2,587
Admiral, yellow	.....	.....	.....	.....	15.7	3,345	.....	.....	3,345
Advancer	7.5	2,997	94.6	2,440	.....	.....	41.3	2,389	2,710
Improved Advancer	.....	.....	23.0	2,391	.....	.....	.....	.....	2,391
Little Gem	.....	.....	.....	.....	17.9	3,350	.....	.....	3,350
Horsford Market Garden	.....	.....	47.2	1,861	51.5	2,583	44.9	2,326	2,260
Prince of Wales	4.3	1,772	14.2	2,343	.....	.....	.....	.....	2,210
Rice's No. 13	24.5	1,823	.....	.....	16.2	2,841	3.0	3,162	2,295
Unclassified	43.1	.....	7.0	.....	65.2	.....	.....	.....	.....
All varieties	376.7	1,971	406.5	2,197	300.0	2,633	179.6	2,099	2,246

returned to the acre, a difference of $2 in the price at which ensilage is charged to the farmer would be equal to a change of about $4 per ton in the price of the shelled peas. (4) The requirements regarding the quality of peas when harvested. (5) The proportion of the different varieties in the total acreage. The acreages and yields of the varieties grown in each area are shown in table 20. The lower average yield in the Orleans area was due partly to the large proportion of the acreage which was given to the Alaska variety. The higher yield for all varieties in the Steuben area was due in part to the practice of allowing the peas to become more mature before harvesting. The peas in this area were also weighed before being cleaned. The prices paid in 1920 did not take sufficient account of these factors.

Return per hour of labor

The good yield per acre and the prices received for peas made them a profitable crop in 1920 (table 21). The estimated cost per ton of shelled peas in 1920 with a yield of 1800 pounds per acre, was $73.66 (table 7, page 18). With this yield there would have been a profit of about 19 cents per hour of labor, or a return of about 62 cents.

TABLE 21. RETURN PER HOUR OF LABOR ON PEAS, ON 262 FARMS IN 1920

	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Return per hour*.....	$0.69	$1.00	$1.17	$0.79	$1.37	$0.98
Cost per hour.....	0.45	0.46	0.39	0.41	0.42	0.43
Profit per hour.....	$0.24	$0.54	$0.78	$0.38	$0.95	$0.55

* The return per hour is calculated by adding to the profit the cost of labor, and dividing by the total hours worked.

The return per hour of labor is one measure by which comparisons may be made between crops. Other factors also must be considered. The more important of these are: competition with other crops for labor or for land; and effect on the yields of other crops in the rotation.

Competition with other crops for labor.—Crops should be grown that will most profitably utilize the available men, horses, and equipment. A crop that yields a low return on the labor may be grown if it keeps men and teams busy at a time when they would otherwise be idle. Similarly, a crop on which work must be done at a time when men and teams can profitably be employed on other crops, must yield a return comparable with the returns from the competing crops. The important competition in the case of peas comes at harvest time. The date of harvesting varies with the season, the variety, and the location. In 1920 it commenced in the latter part of June for the Alaska and other early varieties, and finished about the first of August for the later varieties. This is one of the busiest seasons of the year on most farms in the pea-producing sections. The farmers were asked the question, " With what other farm operations did work on peas conflict?" The most frequent answers to this question were: none, 117; haying, 75; haying and cultivating, 23; haying and wheat harvest, 13; cultivating, 6; wheat harvest and cultivating, 4. The

conflict with cultivating came principally in the Steuben area, with the potato crop. To compete with these crops the returns per hour must be good.

Competition with other crops for land.—The basis of most systems of crop production is a rotation of some sort. The competition for land is between crops that fit equally well into the rotation. The commonest rotation in which peas are grown in the areas studied is: (1) a cultivated crop; (2) peas, beans, oats, or barley; (3) winter wheat; (4) hay. Each farmer was asked what crop he would have grown on the same land if he had not grown peas. The most frequent answers to this question were: oats, 70; barley, 37; oats or barley, 47; beans, 18; hay, 8; cabbage, 10; potatoes, 7. Oats and barley are both crops which normally yield low returns. In 1920 beans were an uncertain crop.

Peas are used also as a crop with which to seed hay or alfalfa. This practice is commonest in the pea-growing sections where wheat is not an important crop. Barley or oats are ordinarily used to seed with in these sections if peas are not grown. The competition for land is less important than the competition for labor.

Effect on the yields of other crops in the rotation.—The opinion is generally held by farmers that wheat yields are better after peas than after oats or barley. Increases in yields of wheat when grown following peas, over the yields of wheat following other crops, according to estimates of the farmers, are given in table 22. If the land on which peas are grown can be worked immediately after the peas are harvested, it may be fitted for wheat without plowing. However, because of other work at this season, it is not usually possible to do this, and it is then necessary to plow and fit the land in the usual manner.

TABLE 22. YIELD OF WHEAT PER ACRE IN RELATION TO THE PRECEDING CROP GROWN

Crop preceding wheat	Number of estimates	Increased yield of wheat after peas, over yield after other crops
Oats	129	5.5 bushels
Barley	93	4.0 bushels
Beans	33	3.7 bushels

VARIATIONS IN THE COST OF PRODUCING PEAS

When the cost-of-production data of any commodity are studied, it is found that there are wide variations in the cost per unit for different producers. The range of costs of producing peas on 262 farms in 1920 is given in table 23.

The average cost of production of peas was $62 a ton, and the cost below which 85 per cent of the crop (tons) was produced was about $75. The average price received for peas was $80.44 per ton. Approximately 90 per cent of the crop was produced at a cost below this. This range of costs is for a year when the yield was higher than the average yield over a period of years. If the yield per acre had been 1800 pounds, the

TABLE 23. RANGE OF COSTS OF PRODUCING PEAS ON 262 FARMS IN 1920

Cost per ton	Average cost per ton	Number of farms	Per cent of total farms	Per cent of farms at this cost or lower	Acres	Per cent of total acres	Per cent of acres at this cost or lower	Tons	Per cent of total tons	Per cent of tons at this cost or lower	Yield per acre (tons)
$ 30–$ 40.....	$ 36	11	4.2	4.2	107.0	7.3	7.3	177.4	10.8	10.8	1.658
40– 50.....	45	40	15.3	19.5	235.0	16.0	23.3	330.6	20.1	30.8	1.407
50– 60.....	54	43	16.4	35.9	267.2	18.2	41.5	343.8	20.8	51.7	1.287
60– 70.....	65	51	19.5	55.3	302.0	20.6	62.1	330.1	20.0	71.7	1.093
70– 80.....	75	44	16.8	72.1	246.0	16.7	78.8	220.6	13.4	85.1	0.897
80– 90.....	85	22	8.4	80.5	143.3	9.8	88.6	129.7	7.9	93.0	0.905
90– 100.....	95	14	5.3	85.9	49.5	3.4	92.0	40.1	2.4	95.4	0.810
100+	119	37	14.1	100.0	118.0	8.0	100.0	75.9	4.6	100.0	0.643
All farms.....	$62	262	100.0	.....	1,468.0	100.0	.....	1,648.2	100.0	.....	1.123

average price received would have covered the cost of producing about 75 per cent of the total crop.

In spite of poor yields obtained in 1919, the acreage of peas grown in 1920 was 16 per cent above the yearly average grown from 1917 to 1920 (table 24). The acreage figures are from reports of the United States Department of Agriculture.

TABLE 24. ACRES OF SELECTED CROPS GROWN IN NEW YORK STATE FROM 1917 TO 1920

Year	Peas		Oats		Potatoes		Winter wheat		Tomatoes	
	Acres	Per cent of average 1917–1920	Acres	Per cent of average 1917–1920	Acres	Per cent of average 1917–1920	Acres	Per cent of average 1917–1920	Acres	Per cent of average 1917–1920
1917.....	19,283	83	1,275,000	106	400,000	106	430,000	99	8,584	92
1918.....	24,203	105	1,260,000	105	380,000	100	380,000	87	10,986	118
1919.....	22,151	96	1,120,000	93	363,000	96	474,000	109	7,807	84
1920.....	26,749	116	1,150,000	96	370,000	98	460,000	106	9,837	106
Average.....	23,096	100	1,201,250	100	378,250	100	436,000	100	9,304	100

The question was asked of each grower, "If prices and costs are the same as this year [1920], will you grow peas next year?" A summary of the answers to this question among the groups of farmers having different costs, shows that the proportion of growers not planning to grow peas in 1921 increased as the cost per ton in 1920 increased (table 25).

TABLE 25. COST PER TON IN 1920 ON 262 FARMS, AND NUMBER OF FARMERS NOT PLANNING TO GROW PEAS IN 1921

Cost per ton in 1920	Number of farms	Number not planning to grow peas in 1921	Per cent of farms in group
Less than $40.....	11	0	0
$ 40–$ 50.....	40	2	5
50– 60.....	43	4	9
60– 70.....	51	9	18
70– 80.....	44	8	18
80–100.....	36	8	22
100+.....	37	14	38
All farms.....	262	45	17

By the method of calculating costs used in this study, even if a grower failed to receive returns that paid all costs he might still have received some returns for his labor and some interest. The question whether or not he should grow peas depends on whether he has an alternative that would give greater returns. Even if the returns are sufficient to pay a profit above all costs, they may not be as good as could be received from some alternative. In such a case peas would not be grown.

LABOR REQUIREMENTS

The land is plowed and fitted until a good seedbed is prepared, spring-tooth and disk harrows and rollers being used according to the nature of the soil. The peas are planted with a grain drill. In practically all cases the land is rolled after the peas have been drilled. This is done to firm the soil around the seed, and also to smooth the land as much as possible to facilitate harvesting. The average hours required to perform the various operations are given in table 26. The hours given are not the average time for those doing the work, but were obtained by dividing the total number of hours spent on the operation by the total number of acres. The average hours required for performing a particular operation once may be obtained by dividing the average hours as given, by the number of times the operation was performed.

TABLE 26. AVERAGE HOURS PER ACRE REQUIRED TO PERFORM VARIOUS OPERATIONS ON THE PEA CROP ON 262 FARMS GROWING 1468 ACRES IN 1920

Operation	Number of times operation was performed	Man hours	Horse hours	Tractor hours
Plowing	1.0	5.7	14.0	0.1
Harrowing	3.5	3.5	9.8	0.1
Disking	0.4	0.4	1.0	0.1
Rolling before drilling	1.2	0.8	1.8	.....
Cultipacking	0.2	0.2	0.5	.....
Hauling fertilizer	.....	0.2	0.5	.....
Hauling seed	.....	0.4	0.8	.....
Drilling	1.0	1.3	2.6	.....
Rolling after drilling	1.0	0.8	1.6	.....
Harrowing after drilling	.....	0.1	0.2	.....
Hauling and spreading manure	.....	2.3	4.6	.....
Hauling and spreading lime	.....	0.1	0.1	.....
Total	.....	15.8	37.5	0.3

The methods of fitting in the Orleans, Genesee, and Ontario areas were similar. The man hours per acre were lower, and the horse hours were higher, in the Genesee area than in the other sections (table 27). This was due partly to the practice of driving more horses per man in the Genesee area, thereby increasing the amount of work done per man in a day. Also, larger acreages of peas were grown per farm in the Genesee area, which might be expected to reduce the hours spent per acre. In the Steuben area the land is stonier than in the other areas and more time was required to plow an acre. After the land was plowed, however, less time was spent to prepare it for drilling. The only tillage that most of the land received was harrowing from two to four times. On a few farms in one locality of this area, peas were planted after potatoes without plowing. The yields on these farms were as good as the average of the region. This was done only on a loose, light soil that had been well tilled the previous year.

TABLE 27. AVERAGE LABOR REQUIREMENTS PER ACRE GROWING PEAS ON 262 FARMS IN 1920

	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Man hours per acre....	17.2	15.0	16.3	15.9	14.2	15.8
Horse hours per acre...	37.8	41.7	35.7	34.3	34.2	37.5
Tractor hours per acre.	0.4	0.2	0.3	0.7	0.4	0.3
Acres per farm.....	5.0	8.5	5.7	3.6	5.9	5.6

Peas are usually harvested with a mowing machine fitted with some special attachments. Special machines have been designed for harvesting peas, but they are not in general use in New York. The peas, after being cut, are bunched, loaded on hay racks, and drawn to the factory or the viner station. Since they are cut when green, they are bulky and heavy. The variations in the time required to harvest peas in the different areas are shown in table 28:

TABLE 28. AVERAGE LABOR REQUIREMENTS PER ACRE HARVESTING PEAS ON 262 FARMS IN 1920

	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
Man hours per acre....	21.4	16.4	29.7	24.2	19.9	21.8
Horse hours per acre...	25.3	22.3	35.2	28.1	21.2	26.2
Man hours per ton.....	21.7	14.9	22.6	23.0	16.5	19.5
Horse hours per ton...	25.7	20.3	26.7	26.8	17.6	23.4
Tons per acre.....	1.00	1.10	1.32	1.05	1.20	1.12
Miles to viner.....	2.3	2.2	2.3	1.4	1.3	2.0
Acres per farm.....	5.0	8.5	5.7	3.6	5.9	5.6

Variations in the length of time required to harvest, other than those due to differences in efficiency on different farms, may be due to a number of causes. Some of these are:

1. Variations in topography. On land which is fairly level and free from stones, the peas can be harvested more rapidly than on land which is more hilly or stony.

2. Differences in acreages of peas per farm and in length of haul to the viner. The farmers growing the larger acreages, or whose farms are nearer the viner station, harvest and haul peas in less time than is required by growers with smaller acreages or with longer hauls.

3. Delay in unloading peas at the factory. At most plants the farmers unload the peas along conveyers which run to the viners. The employees of the factory take care of them after this. At the plants located in the Steuben area, each man waited until his load could be threshed, and then pitched it to the viner directly. In this area the growers estimated that, on the average, about 3.2 hours per acre, or a little less than an hour per load, were lost in waiting to unload. Very few of the farmers in the other areas reported any delays in unloading.

4. Use of labor-saving attachments. There are two types of attachments that are put on an ordinary mowing machine in order that peas may be harvested more efficiently: "lifters," or long guards put on in place of the regular guards at intervals of one foot, which raise the peas so that they can be more easily cut; and "windrowers," or "swathers," which are curved metal bands fastened to the cutter bar to roll the peas back after they are cut. It is usually necessary to have men follow the machine to roll the peas back as they are being cut, so that they are not run over by the machine the next time around. The windrowers aid in this operation and shorten the time required to harvest peas (table 29).

TABLE 29. TYPE OF MACHINE USED IN HARVESTING PEAS, AND HOURS PER ACRE SPENT IN HARVESTING, ON ORLEANS, GENESEE, AND STEUBEN FARMS IN 1920

Type of machine used	Number of farms	Average distance to viner (miles)	Acres of peas per farm	Yield of peas per acre (pounds)	Hours per acre harvesting peas	
					Man	Horse
Mowing machine with windrower	69	2.0	8.0	2,294	18.4	24.7
Mowing machine without windrower	76	2.6	4.7	2,174	24.9	29.7

A number of farmers used an old mowing machine to cut peas. This operation is hard on a mowing machine. On 48 farms out of 228 on which this information was obtained, a mowing machine was used for no other purpose, while on 180 farms the same machine was used that was used in haying.

FACTORS AFFECTING THE COST OF PRODUCTION OF PEAS

Yield per acre

The cost per ton of peas is very closely related to the yield per acre. The effect of the yield on returns is shown in table 30. The costs in detail of producing peas on farms with different yields per acre are given in table 31.

TABLE 30. RELATION BETWEEN YIELD PER ACRE AND COST OF PRODUCTION OF PEAS 262 FARMS, 1920*

Yield per acre (pounds)	Number of farms	Average yield per acre (pounds)	Average growing cost per acre	Increase in growing cost per acre over lowest-yielding group	Return or loss per acre above or below cost of harvesting	Increase in return per acre above cost of harvesting, over group with lowest yield per acre
Less than 1800	81	1,492	$52	.....	-$ 4	.....
1800–2500	101	2,138	54	$2	16	$20
Over 2500	80	2,988	54	2	48	52

* The correlation coefficient between the yield per acre and the cost per ton was extremely high, being -0.724 ± 0.02.

TABLE 31. AVERAGE COST OF PRODUCING AN ACRE OF PEAS ON FARMS WITH DIFFERENT YIELDS PER ACRE, 1920

Item	Yield less than 1800 pounds per acre, 81 farms, 408 acres, averaging 1492 pounds per acre		Yield 1800 to 2500 pounds per acre, 101 farms, 564 acres, averaging 2138 pounds per acre		Yield over 2500 pounds per acre, 80 farms, 496 acres, averaging 2988 pounds per acre	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Seed	4 bu.	$15.78	4 bu.	$15.90	4 bu.	$15.49
Fertilizer	139 lbs.	2.35	161 lbs.	2.80	187 lbs.	3.23
Manure charged to peas	2.4 tons.	4.72	2.9 tons.	6.05	3.0 tons.	6.00
Lime charged to peas	41 lbs.	0.08	62 lbs.	0.11	49 lbs.	0.10
Labor growing peas:						
Human	15.8 hrs.	7.04	16.1 hrs.	7.05	15.6 hrs.	6.70
Horse	36.7 hrs.	8.99	36.8 hrs.	9.02	39.0 hrs.	9.55
Use of equipment	36.7 hrs.	3.01	36.8 hrs.	3.02	39.0 hrs.	3.20
Use of tractor		0.80		0.72		0.33
Use of automobile and truck		0.03		0.04		0.03
Miscellaneous growing expenses		0.06		0.02		0.07
Interest on growing costs		0.62		0.62		0.59
Use of land		8.64		9.02		9.13
Total growing cost		$52.12		$54.37		$54.42
Labor harvesting peas:						
Human	17.4 hrs.	$7.25	22.2 hrs.	$9.27	25.1 hrs.	$10.43
Horse	21.7 hrs.	5.32	26.4 hrs.	6.46	29.9 hrs.	7.32
Use of equipment	21.7 hrs.	1.79	26.4 hrs.	2.16	29.9 hrs.	2.45
Use of automobile, truck, and tractor		0.03		0.12		0.35
Miscellaneous harvesting expenses		0.22		0.30		0.55
Interest on harvesting costs		0.19		0.23		0.19
Total harvesting cost		$14.80		$18.54		$21.29
Total cost of crop		$66.92		$72.91		$75.71
Value of ensilage		2.05		$2.99		3.01
Net cost of shelled peas		$64.87		$69.92		$72.70
Shelled peas sold to factory	0.746 ton.	$60.72	1.069 tons.	$85.50	1.494 tons.	$120.42
Price received per ton		81.39		79.98		80.60
Cost per ton growing		$69.87		$50.86		$36.43
Cost per ton harvesting		19.84		17.34		14.25
Net cost per ton		$86.96		$65.41		$48.66
Return per hour of human labor		$0.31		$0.83		$1.59

The number of farms with yields of less than 1800 pounds per acre was practically the same as the number having yields of 2500 pounds and more per acre. However, only 40 per cent as many tons were produced on the farms with the lower yields (table 32).

TABLE 32. PROPORTION OF PEAS PRODUCED ON FARMS WITH DIFFERENT YIELDS PER ACRE, 262 FARMS, 1920

Yield per acre (pounds)	Number of farms	Per cent of total farms	Number of acres	Per cent of total acres	Number of tons	Per cent of total tons
Less than 1800	81	31	408	28	304	18
1800–2500	101	38	564	38	603	37
Over 2500	80	31	496	34	741	45
All farms	262	100	1,468	100	1,648	100

A number of factors influence the yield per acre. Some of these, such as sowing at the proper time, the quality of the seed when the seed is charged to the farmer at a uniform price, and weather conditions, will not influence the cost of production. Other factors, such as the quantity of seed and fertilizer used per acre, will increase the cost. Whether or not any single factor is profitable depends on whether the value of the increased yield is greater than the cost of the practice.

Acres of peas per farm

Most of the growers raised small acreages of peas (table 33). Peas must be harvested within a limited time, because of the deterioration in quality if they are not cut at the proper stage of growth. The acreage that can be grown per farm may be enlarged by increasing the amount of help available or by extending the period of time in which the peas may be harvested. Additional help may be secured by hiring additional men or teams or by exchanging work with neighbors. The canning companies often furnish men and teams to the larger growers. The current rates are usually charged for these men and teams, but in some cases the charge is only nominal. The period in which peas must be harvested may be lengthened by growing a number of varieties that ripen at different dates, by making several sowings of the same variety, and by not maintaining strict standards as to the quality of the peas when harvested.

TABLE 33. FARMS GROWING DIFFERENT ACREAGES OF PEAS IN EACH AREA IN 1920

Acres of peas per farm	Orleans	Genesee	Steuben	Ontario	Other counties	All farms
1	1	2	2	5	1	11
2	17	3	7	16	8	51
3	13	.....	5	13	5	36
4	12	5	5	4	8	34
5	10	4	8	5	3	30
6	10	7	13	2	4	36
7	4	3	2	1	.....	10
8	2	3	5	2	1	13
9	1	5	.....	1	.....	7
10	2	3	2	.....	.....	7
11	.....	4	3	.....	2	9
12	.....	3	.....	.....	1	4
13	.....	1	.....	.....	.....	1
14	1	1	.....	.....	.....	2
15	2	1	.....	.....	.....	3
16	.....	1	1	1	.....	3
22	1	.....	.....	.....	1	2
23	.....	1	.....	.....	.....	1
34	.....	1	.....	.....	1	2
Total	76	48	53	50	35	262
Acres per farm	5.0	8.5	5.7	3.6	5.9	5.6

While the growers raising small acreages were the most numerous, a comparatively small number of those who raised larger acreages produced a considerable proportion of the total crop (table 34). Ten per cent of

TABLE 34. PROPORTION OF PEAS PRODUCED ON FARMS GROWING DIFFERENT ACREAGES, 262 FARMS, 1920

Acres of peas per farm	Number of farms	Per cent of farms	Acres of peas	Per cent of acres	Tons of peas	Per cent of tons
Less than 6	162	61.8	523	35.6	559	33.9
6–10	73	27.9	528	36.0	600	36.4
Over 10	27	10.3	417	28.4	489	29.7
All farms	262	100.0	1,468	100.0	1,648	100.0

the growers raised about 30 per cent of the total crop. The acres grown per farm did not affect the cost per acre before harvest (table 35). However, the cost of harvesting was considerably less on farms growing larger acreages. This was in spite of the fact that these farms had higher yields than the farms in the other groups. Part of this lower cost is due to the larger acreages grown on farms nearer to the viner. The better yield per acre secured on the farms growing the larger acreages was probably one of the chief reasons why peas were so extensively grown.

TABLE 35. RELATION BETWEEN ACRES OF PEAS PER FARM AND COST OF PRODUCTION, 262 FARMS, 1920

Acres of peas per farm	Number of farms	Average number of acres per farm	Average yield per acre (pounds)	Cost per acre		Total cost		Average distance to viner (miles)
				Growing	Harvesting	Per acre	Per ton	
Less than 6	162	3.2	2,136	$55	$21	$76	$71	2.3
6–10	73	7.2	2,274	53	19	72	63	2.2
Over 10	27	15.4	2,346	54	15	69	59	1.5
All farms	262	5.6	2,246	$54	$18	$72	$64	2.0

Distance to viner

Nearly one-fourth of the peas were grown on farms that were less than one mile from the viner, and only a little over one-fourth on farms three miles or more from the viner (table 36). The ratio between the weight of shelled peas and the weight of peas and vines as they are hauled in to be threshed varies with the variety and the yield per acre. In 1920, with a good yield of peas, the weight of shelled peas was from 15 to 20 per cent of the weight of peas and vines. A ton of peas and vines would be worth $16 if shelled peas were worth 4 cents a pound and the yield of shelled peas were 20 per cent of the weight of peas and vines. A crop that is worth no more than this per ton is too bulky to be hauled far in a busy season. The tendency therefore is to produce peas close to the

factory or the viner. The nearer the farms were located to the viner, the lower was the cost of harvesting (table 37).

TABLE 36. PROPORTION OF PEAS PRODUCED ON FARMS AT DIFFERENT DISTANCES FROM THE VINER, 262 FARMS, 1920

Distance to viner (miles)	Average distance (miles)	Number of farms	Per cent of total farms	Number of acres	Per cent of total acres	Number of tons	Per cent of total tons
Less than 1.....	0.44	47	17.9	336.8	22.9	393	23.8
1–1.9.....	1.28	74	28.3	402.2	27.4	472	28.6
2–2.9.....	2.20	61	23.3	317.3	21.6	342	20.8
3–3.9.....	3.12	38	14.5	205.2	14.0	225	13.7
4 and over.....	4.70	42	16.0	206.5	14.1	216	13.1
All farms.....	2.00	262	100.0	1,468.0	100.0	1,648	100.0

TABLE 37. RELATION BETWEEN DISTANCE TO VINER AND COST OF PRODUCTION OF PEAS, 262 FARMS, 1920

Distance to viner (miles)	Average distance (miles)	Acres of peas per farm	Average yield per acre (pounds)	Cost per acre			Hours per acre harvesting		Charge per acre for use of land
				Growing	Harvesting	Total	Man	Horse	
Less than 1.....	0.44	7.2	2,232	$53	$14	$67	18.3	19.6	$9.93
1–1.9.....	1.28	5.4	2,348	56	18	74	21.6	25.0	9.42
2–2.9.....	2.20	5.2	2,156	54	19	73	21.9	27.9	8.66
3–3.9.....	3.12	5.4	2,190	54	20	74	24.1	29.1	8.13
4 and over.....	4.70	4.9	2,096	52	23	75	25.9	26.2	7.71
All farms.....	2.00	5.6	2,246	$54	$18	$72	21.8	26.2	$8.95

COMPARISON OF DATA OBTAINED BY THE ACCOUNTING AND SURVEY METHODS

On page 5 it is stated that the data were obtained by two methods — the survey and the accounting. The detailed costs of production for the farms on which the costs were obtained by each method are given in table 38. The average cost per acre was substantially the same in both groups of farms. The average yield per acre was higher on the farms that kept accounts. This made a lower cost per ton.

Cost figures obtained exclusively by accounts represent a selected group of farms and do not represent average conditions. Accounts are very useful in cost work, principally because they give the farmer himself more confidence in the figures. However, if the object is to determine average costs, the survey method will give the required information more accurately than will the account method.

TABLE 38. AVERAGE COST OF PRODUCING AN ACRE OF PEAS IN 1920 ON FARMS ON WHICH ACCOUNTS WERE KEPT ON THE CROP, AND ON FARMS ON WHICH COST FIGURES WERE OBTAINED BY THE SURVEY METHOD

Item	Accounts — 56 farms, 348.8 acres, averaging 2494 pounds per acre		Records — 206 farms, 1119.2 acres, averaging 2168 pounds per acre	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Seed	4 bu.	$15.60	4 bu.	$15.74
Fertilizer	202 lbs.	3.28	152 lbs.	2.68
Manure	2.9 tons.	6.16	2.8 tons.	5.51
Lime	37 lbs.	0.10	56 lbs.	0.10
Labor growing peas:				
Human (charged to peas)	15.8 hrs.	6.68	15.9 hrs.	7.01
Horse (charged to peas)	36.6 hrs.	8.97	37.8 hrs.	9.26
Use of equipment	36.6 hrs.	3.00	37.8 hrs.	3.10
Use of tractor	.....	0.79	.....	0.55
Use of automobile and truck	.....	0.07	.....	0.03
Miscellaneous growing expenses	.....	0.09	.....	0.03
Interest on growing costs	.....	0.62	.....	0.61
Use of land	.....	9.04	.....	8.93
Total growing cost	.....	$54.40	.....	$53.55
Labor harvesting peas:				
Human	23.7 hrs.	$10.20	21.3 hrs.	$8.76
Horse	26.8 hrs.	6.58	26.1 hrs.	6.39
Use of equipment	26.8 hrs.	2.21	26.1 hrs.	2.14
Use of automobile, truck, and tractor	.....	0.32	.....	0.13
Miscellaneous harvesting expenses	.....	0.34	.....	0.37
Interest on harvesting costs	.....	0.20	.....	0.20
Total harvesting cost	.....	$19.85	.....	$17.99
Total cost of crop	.....	$74.25	.....	$71.54
Miscellaneous receipts	.....	2.36	.....	2.85
Net cost of shelled peas	.....	$71.89	.....	$68.69
Shelled peas sold to factory	1.247 tons	$99.61	1.084 tons	$87.53
Price received per ton	.....	79.88	.....	80.75
Cost per ton	.....	$57.65	.....	$63.37

TOMATOES

The raising of tomatoes on a scale necessary for commercial canning is limited in New York State to those parts of the State having an average growing season between killing frosts of from 160 to 170 days or longer. Outside of the lower Hudson Valley, where tillable land is limited, and Long Island, where land suited for tomato production is utilized for truck crops for sale in cities, the only section having a growing season of this length is a belt extending along Lakes Ontario and Erie (fig. 3). The protection

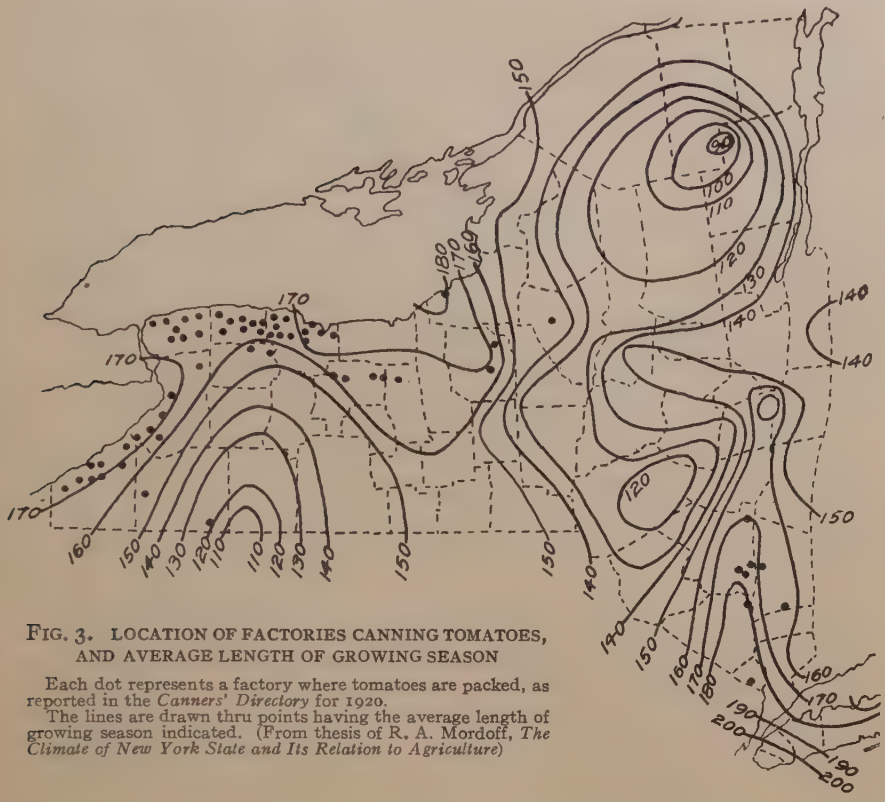

FIG. 3. LOCATION OF FACTORIES CANNING TOMATOES, AND AVERAGE LENGTH OF GROWING SEASON

Each dot represents a factory where tomatoes are packed, as reported in the *Canners' Directory* for 1920.
The lines are drawn thru points having the average length of growing season indicated. (From thesis of R. A. Mordoff, *The Climate of New York State and Its Relation to Agriculture*)

from frost which these lakes give, makes a growing season long enough so that tomatoes can be grown safely.

Data on the cost of producing tomatoes were obtained by both the survey and the accounting method in three areas — Orleans County, Niagara County, and Chautauqua and Erie Counties. The last-named section is designated in the following discussion as the Chautauqua area. The location of these areas is shown in figure 4. The number of farms on which cost figures were obtained by each method is given in table 39:

TABLE 39. FARMS ON WHICH COST FIGURES ON TOMATOES WERE OBTAINED IN 1920

Area	Accounts	Records	Total
Orleans	12	37	49
Niagara	6	37	43
Chautauqua	8	33	41
All farms	26	107	133

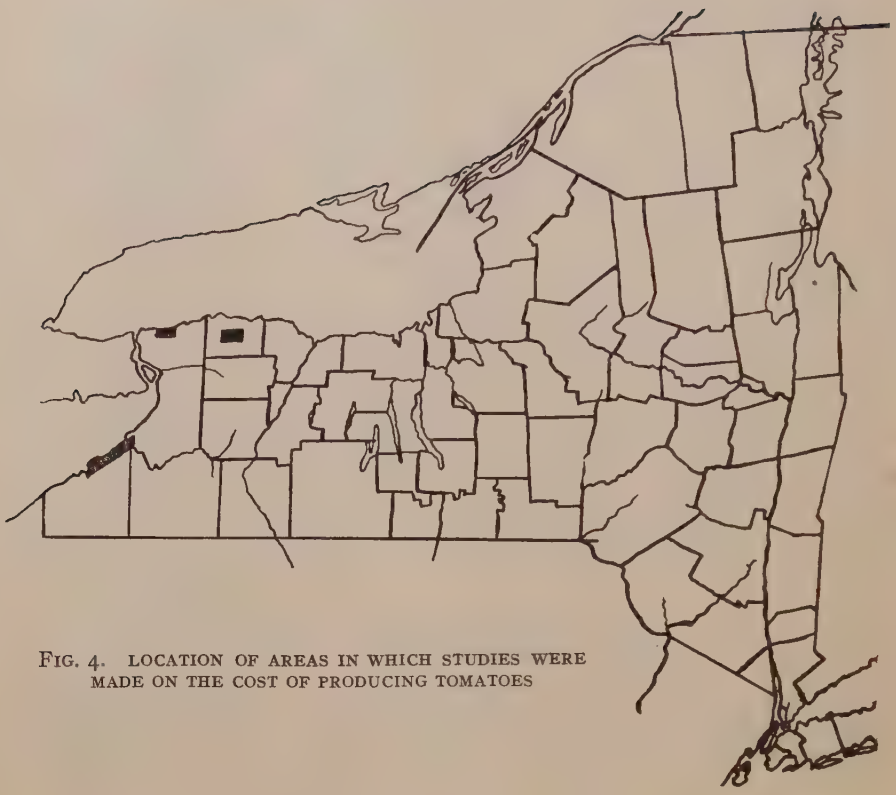

FIG. 4. LOCATION OF AREAS IN WHICH STUDIES WERE MADE ON THE COST OF PRODUCING TOMATOES

AGRICULTURAL CONDITIONS IN THE AREAS STUDIED

Orleans area

The greater part of the tomatoes grown in Orleans County are taken by local factories, which are situated in all the larger villages. The average number of days between killing frosts is from 160 to 170. This is due to the proximity of Lake Ontario. There is no soil survey of Orleans County, but the soils on which tomatoes are grown would probably be classed chiefly as Ontario loam, silt loam, and fine sandy loam, Lockport stony clay loam, and Dunkirk gravelly sandy loam. The last-named is located along the ridge road. This county is in the Lake Ontario fruit belt. Apples are the most important crop. Hay, winter wheat, pears, and peaches also are important, and a variety of other crops are grown (table 40).

Niagara area

Tomatoes are grown thruout most of the northern part of Niagara County. There are several factories that pack tomatoes in this county. One of the centers of heaviest production is the township of Wilson. The Niagara Preserving Company operates a factory in the village of Wilson, which is also one of the principal loading points for tomatoes to be shipped

to the Curtice Brothers Company's plant in Rochester. Most of the farms visited in Niagara County were in this vicinity. The township borders on Lake Ontario. The protection against frost is probably better in this locality than in the Orleans area. The land in this section is nearly level. The soils are chiefly Clyde loam and fine sandy loam, and Dunkirk loam and fine sandy loam.

TABLE 40. CROPS GROWN IN 1920 ON FARMS FOR WHICH COST DATA ON TOMATOES WERE OBTAINED

Crop	Acres per farm			Per cent of total crop acres		
	Orleans	Niagara	Chautauqua	Orleans	Niagara	Chautauqua
Tomatoes	4.5	2.7	6.5	6.1	4.7	11.3
Beans	0.2	0.2	1.0	0.3	0.3	1.8
Cabbage	1.7	1.5	0.2	2.4	2.6	0.4
Corn for grain	2.9	4.4	3.5	4.0	7.6	6.0
Corn for silage	2.8	3.8	2.5	3.9	6.7	4.4
Sweet corn	1.6	1.4	0.6	2.1	2.5	1.1
Potatoes	1.2	0.9	1.6	1.6	1.6	2.7
Garden	0.1	0.6	0.3	0.1	1.1	0.4
Buckwheat	0.3	0.2	1.2	0.3	0.4	2.1
Oats and barley	.....	.....	0.3	.....	.....	0.4
Oats	5.3	6.9	9.4	7.2	12.0	16.2
Barley	2.2	0.2	.....	3.0	0.3	.....
Peas	2.6	0.5	1.5	3.6	0.8	2.7
Winter wheat	11.8	7.3	0.8	16.2	12.8	1.4
Spring wheat	.....	.....	0.8	.....	.....	1.3
Rye	.....	.....	0.2	.....	.....	0.3
Hay	22.0	12.3	12.7	30.2	21.4	21.9
Alfalfa	0.3	.....	0.1	0.4	.....	0.1
Berries	.....	.....	2.3	.....	.....	3.9
Grapes	.....	0.5	10.0	.....	0.9	17.4
Orchard	13.7	14.0	0.9	18.6	24.3	1.6
Nursery stock	.....	.....	1.5	.....	.....	2.5
Currants	.....	.....	0.1	.....	.....	0.1
Total crops	73.2	57.4	58.0	100.0	100.0	100.0
Total acres in farm	101.4	73.3	80.0	.....	.....	.....

The most important farm enterprise is the production of fruit — particularly apples, peaches, and pears, altho cherries, plums, and grapes also are grown. A few acres of hay, winter wheat, corn for grain or silage, and a variety of truck crops, are raised on each farm (table 40). The most important of the truck crops are tomatoes, cabbage, and sweet corn. The total acreage and crop acres per farm are smaller than on the farms in the Orleans area.

Chautauqua area

The farms included in the Chautauqua area are located in both Chautauqua and Erie Counties, but only a few are in the latter county. The principal tomato-producing section in this area occupies a narrow strip

of land along Lake Erie, commencing about twenty-five miles southwest of Buffalo and extending thru these two counties into Pennsylvania. A number of factories canning tomatoes and making various tomato products are located in this section, and large quantities of tomatoes are shipped out. The H. J. Heinz Company is the largest buyer of tomatoes in the belt, shipping them to its Pittsburg plant.

This region is one of the most important grape-producing sections in the United States. The land slopes back from Lake Erie to some rather steep hills two to six miles from the lake. The air drainage which this topography furnishes, together with the protection furnished by the lake, gives this narrow belt as nearly complete protection against frosts as could be secured in a region located so far north. The topography is level to rolling. The soils are variable. Close to the lake they are principally silt and clay loams, belonging to the Dunkirk series; farther back from the lake there are more gravelly loams of the Dunkirk and Chenango series.

Grapes are the most important crop, with tomatoes second in importance on the farms on which cost figures were obtained. Berries of various kinds also are extensively grown on a small number of farms. Hay, oats, and corn are grown for feed, and a variety of other crops are raised to a limited extent (table 40).

Aside from the climatic advantages which this section has for tomato production, the work on the tomato crop fits in well with that on the other crops grown. Farmers who have a large acreage of grapes and berries require a large amount of help at certain seasons. The work on tomatoes comes at times when the labor is not busy with these other crops.

COST OF PRODUCTION

The average cost of producing an acre of tomatoes in 1920 on the 133 farms on which data were obtained, is given in table 41. The average cost in the different areas is given in table 42.

TABLE 41. AVERAGE COST OF PRODUCING AN ACRE OF TOMATOES ON 133 NEW YORK FARMS GROWING 602.2 ACRES IN 1920

(Average yield per acre, 8.7 tons)

Item	Quantity per acre	Cost per acre	Per cent of total cost
Plants	3,377	$21.98	13.3
Fertilizer	602 lbs.	13.35	8.1
Manure charged to tomatoes	3 tons	6.23	3.8
Labor growing tomatoes:			
Human	62.0 hrs.	26.19	15.9
Horse	61.1 hrs.	14.98	9.1
Use of equipment	61.1 hrs.	5.01	3.0
Use of tractor	0.7 hr.	1.31	0.8
Use of automobile and truck		0.46	0.3
Miscellaneous growing expenses		0.25	0.2
Interest on growing costs		2.03	1.2
Use of land		13.60	8.3
Total growing cost		$105.39	64.0

TABLE 41 (*continued*)

Item	Quantity per acre	Cost per acre	Per cent of total cost
Labor harvesting tomatoes:			
Human	102.7 hrs.	$42.58	25.9
Horse	37.4 hrs.	9.15	5.6
Use of equipment	37.4 hrs.	3.06	1.8
Use of automobile and truck		3.36	2.0
Miscellaneous harvesting expenses		0.59	0.4
Interest on harvesting costs		0.46	0.3
Total harvesting cost		$59.20	36.0
Total cost of crop		$164.59	100.0
Tomatoes disposed of other than to factory	0.08 ton.	$ 2.47	
Tomatoes sold to factory	8.64 tons.	183.17	
Total receipts from tomatoes	8.72 tons.	$185.64	
Price received per ton		$21.29	
Cost per ton growing		$12.09	
Cost per ton harvesting		6.79	
Total cost per ton		$18.88	

The cost of plants, fertilizer, and manure made up about one-fourth of the total cost; the cost of human labor about two-fifths; and the charge for the use of land about one-twelfth. Nearly two-thirds of the cost was incurred previous to harvesting. With a smaller yield the growing cost would represent a larger proportion of the total cost, as the harvesting cost would be lower.

Estimating average costs

The average yield was 8.7 tons per acre. This is higher than the average yield on these farms over a period of years. The most important single factor affecting tomato yields is the weather. The season of 1920 was favorable for tomato production. The cool, dry weather during the early part of the season made strong, healthy plants on which the tomatoes set heavily, while the warm weather during the late summer and early fall was very favorable for ripening the crop. The growing season was long. The first killing frost thruout most of the tomato belt did not come until well into November, which allowed all the tomatoes to ripen.

The farmers were asked to estimate what they considered an average yield of tomatoes on their farms would be if they were given the same care as in 1920. The answers indicated that an average yield on these farms would be about 7.8 tons per acre. This is a somewhat higher yield than would be indicated by the tons of tomatoes received at some of the factories for the past few years. The estimated cost of producing one ton of toma-

TABLE 42. AVERAGE COST OF PRODUCING AN ACRE OF TOMATOES IN 1920 IN DIFFERENT AREAS

Item	On 49 farms in the Orleans area growing 219.4 acres		On 43 farms in the Niagara area growing 115.3 acres		On 41 farms in the Chautauqua area growing 267.5 acres	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Plants	3,547	$22.04	3,208	$22.49	3,310	$21.67
Fertilizer	487 lbs.	9.58	475 lbs.	12.29	750 lbs.	16.91
Manure charged to tomatoes	3.8 tons	7.86	4.1 tons	8.47	1.9 tons	3.94
Labor growing tomatoes:						
Human	62.3 hrs.	27.48	67.3 hrs.	29.72	59.5 hrs.	23.61
Horse	68.9 hrs.	16.88	72.0 hrs.	17.65	49.9 hrs.	12.28
Use of equipment	68.9 hrs.	5.65	72.0 hrs.	5.91	49.9 hrs.	4.11
Use of tractor	0.3 hr.	0.49	1.0 hr.	1.68	1.0 hr.	1.82
Use of automobile and truck		0.14		0.55		0.69
Miscellaneous growing expenses		0.14		0.53		0.21
Interest on growing costs		1.97		2.27		1.98
Use of land		10.37		10.60		17.55
Total growing cost		$102.60		$112.16		$104.77
Labor harvesting tomatoes:						
Human	96.5 hrs.	$44.11	121.0 hrs.	$53.05	100.0 hrs.	$36.81
Horse	41.8 hrs.	10.25	50.1 hrs.	12.28	28.2 hrs.	6.91
Use of equipment	41.8 hrs.	3.43	50.1 hrs.	4.11	28.2 hrs.	2.31
Use of automobile and truck		3.33		3.08		3.50
Miscellaneous harvesting expenses				1.93		0.50
Interest on harvesting costs		0.62		0.70		0.37
Total harvesting cost		$61.74		$75.15		$50.40
Total cost of crop		$164.34		$187.31		$155.17
Tomatoes disposed of other than to factory	0.04 ton.	$ 1.25	0.06 ton.	$ 1.17	0.10 ton.	$ 3.67
Tomatoes sold to factory	9.55 tons	209.14	9.25 tons	204.58	7.65 tons	153.04
Total receipts from tomatoes	9.59 tons	$210.39	9.31 tons	$205.75	7.75 tons	$156.71
Price received per ton		$21.94		$22.10		$20.22
Cost per ton growing		$10.70		$12.05		$13.52
Cost per ton harvesting		6.44		8.07		6.50
Total cost per ton		$17.14		$20.12		$20.02

toes in 1920 if the yield had been 7 tons to the acre, is shown in table 43. This was calculated by the method explained on page 18, where a similar table is given for the pea crop.

TABLE 43. ESTIMATED COST OF PRODUCING ONE TON OF TOMATOES IN 1920 WITH A YIELD OF 7 TONS PER ACRE

(Based on data from 133 farms)

Cost up to harvesting	$105.39 ÷ 7	= $15.06
Cost of harvesting	59.20 ÷ 8.72	= 6.79
Total cost per ton of tomatoes		$21.85

The cost of production varies with changes in the price of the various items of cost. By using the quantities of the various items, the cost with different prices may be estimated. The quantities of the principal

items required to produce one ton of tomatoes in 1920 with a yield of 7 tons per acre, are listed in table 44. The method of calculating these quantities is explained on page 18. With 1920 prices the items included made up about 95 per cent of the total cost.

TABLE 44. ESTIMATED QUANTITIES OF THE PRINCIPAL ITEMS REQUIRED TO PRODUCE ONE TON OF TOMATOES IN 1920 WITH A YIELD OF 7 TONS PER ACRE *

(Based on data from 133 farms)

Item	Quantity
Plants	482
Fertilizer	86 pounds
Manure	0.4 ton
Human labor	20.7 hrs.
Horse labor	13.0 hrs.
Use of equipment	13.0 hrs.
Use of land	0.14 acre

* The items included made up 95 per cent of the total cost in 1920.

Plants

With the exception of human and horse labor, the expense for plants was the largest item of cost. The most usual number of plants set per acre was 3000, but the average number was over 3000 (table 45).

TABLE 45. NUMBER OF TOMATO PLANTS USED PER ACRE, AND AVERAGE COST PER THOUSAND, 133 FARMS, 1920

Area	Plants, first setting	Plants reset	Total plants used	Average cost per thousand
Orleans	3,455	92	3,547	$6.21
Niagara	3,147	61	3,208	7.01
Chautauqua	3,137	173	3,310	6.55
All farms	3,255	122	3,377	$6.51

Because of the climatic conditions in New York State, tomato plants must be raised under glass. They are usually started in hothouses and hardened in coldframes, and transplanted once. Most of the farmers do not grow their own plants because they do not have the necessary equipment. The plants are for the most part grown by plant growers or by the canning companies, who have greenhouses and the other special equipment needed. There are a few farmers who grow enough plants for their own needs. Among the farmers from whom cost figures were obtained, 1 in the Orleans area, 2 in the Niagara area, and 11 in the Chautauqua area, used home-grown plants.

When furnished by or thru the company, the plants are not paid for in cash but are charged to the farmer's account, the cost being deducted from the first payment due the farmer for tomatoes. When the farmer buys plants from a plant grower, there are usually two prices, the cash

price and the fall-payment price. The difference in these two prices is usually 50 cents per thousand. This amount would be interest at the rate of $16\frac{2}{3}$ per cent a year if the cash price were $6 per thousand and the difference in date of payments were six months. There is, of course, some risk of the grower not being able to collect for the plants in the fall. In calculating costs when growers used their own plants, the plants were charged at the price that would have been paid for plants of a similar quality. No expenses incurred in raising the plants were included in the costs.

Fertilizer

Fertilizer was an important item in the cost of producing tomatoes. The extent to which fertilizer was used in the different areas is shown in table 46. Of the 133 farms, 123 used fertilizer on tomatoes. The heaviest applications were made in the Chautauqua area.

TABLE 46. USE OF FERTILIZER ON TOMATOES IN 1920

Area	Number of farms using fertilizer on tomatoes	Per cent of farms using fertilizer on tomatoes	Number of acres on which fertilizer was used	Per cent of land in tomatoes which was fertilized	Average quantity of fertilizer used per acre fertilized (pounds)
Orleans	46	94	209.4	95	511
Niagara	38	88	101.8	88	538
Chautauqua	39	95	258.2	97	777
All farms	123	92	569.4	95	637

The kinds and quantities of fertilizer used are shown in table 47. Acid phosphate, which made up about 25 per cent of the total fertilizer, was used more than any other kind. The balance was mainly a variety of kinds of mixed fertilizers. A considerable number of these were fairly high in nitrogen and potash as well as in phosphorus.

TABLE 47. KINDS AND QUANTITIES OF FERTILIZER USED ON THE 123 FARMS USING FERTILIZER ON TOMATOES IN 1920

Kind of fertilizer *	Number of farms using	Acres of tomatoes on which used	Total pounds applied	Total cost	Per cent of total pounds
1–8–1	1	3.0	1,067	$ 20.00	0.3
1–8–2	11	35.0	17,675	346.17	4.9
1–8–3	1	2.0	800	15.00	0.2
1–8–4	3	7.3	2,835	67.29	0.8
1–9–3	1	4.0	1,600	35.20	0.4
1–10–0	2	4.0	1,230	20.56	0.3
1.5–10–0	1	4.0	500	10.50	0.1
2–6–2	1	3.0	750	18.00	0.2

* The numbers used to designate the kinds of fertilizer refer to the percentages of the three constituents, nitrogen, phosphoric acid, and potash, in the fertilizer: for example, a 1–8–2 fertilizer contains 1 per cent of nitrogen (N), 8 per cent of phosphoric acid (P_2O_5), and 2 per cent of potash (K_2O).

TABLE 47 (*continued*)

Kind of fertilizer *	Number of farms using	Acres of tomatoes on which used	Total pounds applied	Total cost	Per cent of total pounds
2– 8– 0	2	4.2	2,000	37.00	0.6
2– 8– 1	2	12.0	6,000	124.50	1.7
2– 8– 2	18	65.9	32,185	735.70	8.9
2– 8– 3	6	21.0	14,283	358.50	3.9
2– 8– 4	8	19.0	7,270	185.81	2.0
2– 8– 5	11	37.2	19,755	543.09	5.5
2– 8–10	8	47.0	35,000	959.00	9.7
2–10– 0	17	68.0	40,735	735.92	11.2
2–10– 4	1	5.0	500	14.00	0.1
2–12– 0	2	6.5	2,537	54.89	0.7
3– 8– 4	2	5.3	2,432	73.92	0.7
3– 8– 5	8	44.0	36,150	944.74	10.0
3– 8–10	1	3.0	2,100	70.35	0.6
3–10– 6	1	5.0	2,500	78.70	0.7
3.5–10–0	1	7.0	7,000	168.00	1.9
4– 8– 3	1	4.0	700	18.90	0.2
4– 8– 4	3	18.5	10,200	302.50	2.8
4– 8– 5	1	6.0	4,000	104.00	1.1
4– 8– 7	1	4.0	6,000	209.25	1.7
5– 8– 2	1	6.0	2,100	55.12	0.6
6– 8– 2	1	2.0	1,000	24.00	0.3
0–10– 8	1	2.0	1,000	28.50	0.3
Acid phosphate	25	147.5	88,350	1,270.13	24.2
Bone meal	4	9.8	5,334	133.85	1.5
Nitrate of soda	7	31.2	3,350	134.80	0.9
Ground fish	1	2.0	2,000	111.00	0.6
Hen manure	1	2.0	1,000	25.00	0.3
Wood ashes	1	2.2	500	7.50	0.1
Total	157†	649.6	362,438	$8,041.39	100.0

* See note on page 48 for numbers used to designate the kind of fertilizer.
† Some of the 123 farms used more than one kind of fertilizer.

Manure

The total amount of manure applied in each of the three areas, and the rate at which it was applied, are shown in table 48. In the Chautauqua area only about half of the land in tomatoes had been manured since 1917, but more fertilizer was used per acre there than in the other areas.

TABLE 48. MANURE APPLIED FROM 1917 TO 1920, TO LAND IN TOMATOES IN 1920

Area	Acres of tomatoes	Acres manured	Tons of manure applied	Tons charged to crop	Tons charged to crop per acre of tomatoes
Orleans	219.4	187.0	2,580	835	3.8
Niagara	115.3	92.5	1,429	470	4.1
Chautauqua	267.5	132.2	1,769	519	1.9
All farms	602.2	411.7	5,778	1,824	3.0

The greater part of the manure was applied directly to the tomato crop or to the preceding crop (table 49). If the charge for manure had been calculated by charging to tomatoes 50 per cent of the manure applied to this land in 1920, 30 per cent of the manure applied in 1919, and 20 per cent of the manure applied in 1918, 3.4 tons per acre instead of 3 tons would have been charged to the crop.

TABLE 49. APPLICATIONS OF MANURE, BY YEARS, TO LAND IN TOMATOES IN 1920

Year manure was applied	Total manure applied		Manure charged to crop	
	Tons	Per cent	Tons	Per cent
1920	2,864	49.6	1,140	62.5
1919	1,487	25.7	450	24.7
1918	915	15.8	183	10.0
1917	512	8.9	51	2.8
Total	5,778	100.0	1,824	100.0

Lime

Lime had been used on the land in tomatoes in 1920 on 4 farms in the Orleans area, 1 in the Niagara area, and 3 in the Chautauqua area, during the years 1916 to 1920. The average yield on these 8 farms was 8.6 tons per acre, while the average yield on all farms was 8.7 tons per acre. The cost of lime charged to the crop is included under miscellaneous expenses in the summary of costs.

Labor

The average rates per hour at which the various classes of labor were charged are given in table 50. The rates for family labor were similar in the different areas, but the rates for hired labor were considerably lower in the Chautauqua area.

TABLE 50. RATES PER HOUR FOR DIFFERENT CLASSES OF LABOR ON TOMATOES, 133 FARMS, 1920

Class of labor	Orleans	Niagara	Chautauqua	All farms
Growing:				
Operators	$0.48	$0.49	$0.47	$0.48
Sons over 16	0.45	0.38	0.46	0.43
Other family	0.31	0.30	0.35	0.32
All family	0.45	0.45	0.46	0.45
Hired men	0.43	0.42	0.36	0.40
Other hired labor	0.43	0.36	0.28	0.33
Total hired labor	0.43	0.41	0.33	0.37
Total growing	$0.44	$0.44	$0.40	$0.42

TABLE 50 (*continued*)

Class of labor	Orleans	Niagara	Chautauqua	All farms
Harvesting:				
Operators	$0.49	$0.50	$0.46	$0.48
Sons over 16	0.44	0.42	0.44	0.43
Other family	0.31	0.34	0.36	0.33
All family	0.44	0.45	0.45	0.45
Hired men	0.47	0.39	0.37	0.41
Other hired labor	0.47	0.44	0.30	0.37
Total hired labor	0.47	0.40	0.32	0.38
Total harvesting	$0.46	$0.44	$0.37	$0.42

The proportion of the work done by these different classes of labor is given in table 51. Nearly 75 per cent of all the work on tomatoes on the farms in the Niagara area was done by family labor. The acreages grown in the Niagara area were so small that extra help was not needed. In the other areas it was necessary to hire more help to grow and harvest the crop. A large proportion of the hired help, particularly at harvest, was women, who are included under "Other hired labor." The lower wage rate paid for this class of labor in the Chautauqua area explains the lower cost of total hired labor there.

TABLE 51. PROPORTION OF WORK ON TOMATOES PERFORMED BY DIFFERENT CLASSES OF LABOR, 133 FARMS, 1920

Class of labor	Per cent of work done			
	Orleans	Niagara	Chautauqua	All farms
Growing:				
Operators	48	56	40	46
Sons over 16	4	11	9	7
Other family	10	8	5	8
All family	62	75	54	61
Hired men	28	21	27	26
Other hired labor	10	4	19	13
Total hired labor	38	25	46	39
Total growing	100	100	100	100
Harvesting:				
Operators	33	47	26	34
Sons over 16	2	8	7	5
Other family	11	15	5	9
All family	46	70	38	48
Hired men	19	22	15	18
Other hired labor	35	8	47	34
Total hired labor	54	30	62	52
Total harvesting	100	100	100	100

Miscellaneous expenses

The items included under miscellaneous expenses, and the amounts at which they were charged, are given in table 52. A few farmers had sown a cover crop in the fall of 1919 on the land in tomatoes in 1920. Seed and other costs on the cover crop were charged to the tomato crop. In one locality a group of farmers cooperated with the factory and the New York State College of Agriculture in employing a specialist to study diseases and other problems affecting the production of canning crops, particularly tomatoes. In the Chautauqua area, in addition to wages, the car fare of extra help was sometimes paid by the farmer. In the Niagara area the growers' association received 1 per cent of the returns from the tomatoes of association members for selling the crop. The companies deducted this from the payments to the farmers and paid it to the association. The returns were figured on the prices before the deduction was made, and the 1 per cent was included as a cost. In the Chautauqua area a large proportion of the tomatoes was sold thru an association, which received 60 cents a ton for this service. This was not included in the price when the returns were calculated, and was therefore not included as a cost. A few growers sold tomatoes before the factories opened. Baskets for these were included as a cost.

TABLE 52. MISCELLANEOUS EXPENSES ON TOMATOES, 133 FARMS, 1920

Item	Orleans	Niagara	Chautauqua	Total
Growing:				
Hauling fertilizer	.....	$ 4.00	$ 1.00	$ 5.00
Cover-crop expenses	$15.00	30.50	33.00	78.50
Spray materials	3.00	.....	13.00	16.00
Fellowship fees	.....	25.00	.....	25.00
Car fare of help for setting plants	.....	.....	5.04	5.04
Lime	13.47	1.62	5.20	20.29
Total growing	$31.47	$61.12	$57.24	$149.83
Harvesting:				
Association fees	.....	$220.18	.....	$220.18
Baskets for early crop	.....	2.25	$121.91	124.16
Car fare of pickers	.....	.....	10.80	10.80
Total harvesting	.....	$222.43	$132.71	$355.14

Interest

As previously explained, interest was charged from the average date when the costs were incurred until returns were received for the tomatoes. The dates at which payment was made varied somewhat. Payment was usually made in two installments. The larger companies paid about one month after the tomatoes were delivered. Ordinarily the smaller companies did not pay as promptly as this. Because of the unsatisfactory condition of the canned-tomato market, some of the smaller companies made only partial payments on the contract dates.

Use of land

The value of the land on which tomatoes were grown, and the average charge per acre for land operated under various tenures, are given in table 53. The highest land values were in the Chautauqua area. This section has climatic and soil conditions which make it particularly adapted to the production of grapes, tomatoes, and other crops that require protection against frost. The acreage of such land is limited. It therefore has a high sale value.

TABLE 53. VALUE PER ACRE AND CHARGES FOR USE OF LAND IN TOMATOES, 133 FARMS, 1920

Area	Value per acre*	Charges per acre			
		Land owned	Land share-rented	Land cash-rented	All farms
Orleans	$130	$11.16	$ 9.54	$ 4.65	$10.37
Niagara	130	11.20	8.96	6.00	10.60
Chautauqua	232	19.18	16.40	11.50	17.55
All farms	$170	$14.92	$10.19	$10.23	$13.60

* Includes only value of land owned or worked on shares.

Most of the tomatoes were grown on land operated by owners (table 54). Because of the amount of labor required by the tomato crop, it is not a very satisfactory crop for a tenant. When grown on shares, the landlord sometimes pays part or all of the cost of the labor of picking.

TABLE 54. PROPORTION OF ACRES OF TOMATOES GROWN UNDER DIFFERENT TENURES, 1920

Tenure	Per cent of acres of tomatoes grown			
	Orleans	Niagara	Chautauqua	All farms
Owned	66	75	76	72
Worked on shares	29	23	4	17
Cash-rented	5	2	20	11
Total	100	100	100	100

RETURNS

The prevailing contract prices for the season of 1920 were $22.50 per ton in the Orleans and Niagara areas and $20 per ton in the Chautauqua area. The tomato crop of 1920 was being harvested just as the business depression was beginning to affect the wholesale price of canned tomatoes.

The prices of canned tomatoes per dozen by months for the years 1919 and 1920 are given in table 55:

TABLE 55. PRICES OF CANNED TOMATOES PER DOZEN, BY MONTHS, IN 1919 AND 1920*

Month	1919	1920
January	$1.80	$1.70
February	1.85	1.70
March	1.50	1.55
April	1.45	1.45
May	1.45	1.65
June	1.70	1.65
July	1.65	1.55
August	1.65	1.55
September	1.90	1.40
October	1.85	1.25
November	1.80	1.10
December	1.75	1.10

*Prices are for No. 3 Standard, f. o. b. Baltimore, as given in the *Almanac of the Canning Industry* (published by the *Canning Trade*, Baltimore) for 1920 and for 1921, page 61.

The 1920 crop of tomatoes was large all over the United States. As a result a considerable part of the crop in certain sections was not harvested. Farmers' estimates of the tons per acre of unharvested tomatoes on the farms studied, were: Orleans, 3.49 tons; Niagara, 1.18 tons; Chautauqua, 2.64 tons. In Niagara County the leading buyer accepted tomatoes up to October 15, the last date at which, according to the contract, deliveries were to be accepted. On farms growing for this company, the estimate of unharvested tomatoes per acre was approximately 1 ton. Even if no attempt had been made to restrict deliveries, some tomatoes would have gone to waste, principally on account of the conflict with the fruit harvest.

Companies may cut down deliveries by being extremely particular as to the quality, by restricting deliveries to a certain number of baskets per day, by accepting tomatoes only on certain days each week, by holding back crates, or by shutting down the plant before the tomatoes are all harvested. When the tomatoes cannot be picked as they ripen, they will soften so that they become too poor in quality to be accepted. Some of the companies had contracts limiting the quantity of tomatoes they would accept to 20 baskets, or about 600 pounds per acre, per day. When the crop was as good as in 1920, this quantity allowed for acceptance of only a part of the ripe tomatoes during the heaviest pickings.

Toward the end of the season some factories cut the price. This may be done in two ways: by paying a lower price per ton, or by deducting a certain percentage from the weight of the tomatoes as they are drawn in. Where the latter method was followed, the total weight of the tomatoes as delivered to the factory was used in this study in all yield figures. The average price received per ton was therefore lower than the contract price.

On the farms studied, very few tomatoes were disposed of other than to the factories (table 56). In the Niagara and Orleans areas the sales

were merely local, while in the Chautauqua area some tomatoes were sold in near-by cities or shipped to more distant markets. The average price received for the market tomatoes sold in the Chautauqua area was 2.6 cents a pound. This was not the net price, as there were expenses for baskets and other marketing costs.

TABLE 56. POUNDS OF TOMATOES SOLD ON 133 FARMS, 1920

Means of disposal	Orleans	Niagara	Chautauqua
Sold to factory	4,189,968	2,117,082	4,093,778
Sold other than to factory	3,360	2,000	33,278

A larger proportion of the tomatoes would probably have been sold as market tomatoes in years when the market for them was better. In 1919, on 326 farms in the Chautauqua area, 3.7 per cent of the tomatoes sold did not go to the canning companies.[4] Market conditions for canned tomatoes were different in 1919 (table 55). The canners then accepted all tomatoes that were offered.

It is evident that the returns from tomatoes grown for manufacture depend in part on market conditions in the fall, even if the tomatoes are contracted for in advance. When tomatoes that are not contracted for are bought in the fall, as is common in some sections, both the price and the quantity that will be bought will vary with the price at which the manufactured products can be sold. The size of the crop and of the resulting pack is, of course, a large factor in the price at which the manufactured products can be sold. If the price paid for contracted tomatoes varied with the price at which the manufactured products could be sold, the restriction of deliveries on the part of the canners and the sales to outside markets by farmers would be less likely to occur. The canner would be protected against losses to which he is exposed when he obligates himself to accept an extremely variable and unknown quantity of tomatoes at a fixed price, to be manufactured into a product the price of which is unknown. When the canner protects himself by selling "futures," he does not incur this risk except on the unsold part of his pack. In years when the production of canned tomatoes is above the average, the risk on the unsold part of a pack must necessarily be considerable. The farmer also would get a higher return for a short crop, as the price per ton under such circumstances would ordinarily be higher than the usual contract price. He would get a smaller return in years when the production was large, but would be assured of a market for his entire crop at some price.

Return per hour of labor

The return per hour of labor spent on the crop is shown in table 57. These figures are for a year when the yield per acre was better than the average. With a yield per acre of 7 tons, the cost per ton on these farms in 1920 would have been about $21.85 and the return per hour of labor

[4] From unpublished data of survey made by the Department of Vegetable Gardening, Cornell University, 1919.

would have been about 39 cents (table 43, page 46). This was 3 cents less than the average cost per hour of labor, and was practically the cost per hour of all hired labor.

TABLE 57. RETURN PER HOUR OF LABOR ON TOMATOES, ON 133 FARMS IN 1920

	Orleans	Niagara	Chautauqua	All farms
Return per hour*	$0.74	$0.54	$0.39	$0.55
Cost per hour	0.45	0.44	0.38	0.42
Profit per hour	$0.29	$0.10	$0.01	$0.13

* The return per hour is calculated by adding to the profit the cost of labor, and dividing by the total hours worked.

Besides the return per hour of labor, there are other factors to be considered in comparing the returns from different enterprises. In the case of the tomato crop, probably the most important of these is competition with other crops for labor. The farmers were asked with what operation the work on the tomato crop conflicted. The most frequent replies were: none, 80; picking peaches, 15; picking apples, 14; sowing wheat, 9; picking pears, 4.

Where large acreages of peaches, early apples, or pears are grown, the tomatoes are competing for labor with crops that ordinarily are profitable. The acreage of tomatoes grown by farmers with a considerable acreage of these kinds of fruit, is usually so small that the conflict is not serious. These fruits are grown most extensively in the Niagara area, where the acreages of tomatoes per farm were small.

Competition for the use of land also must be considered. The rotation in which tomatoes are usually grown is: (1) a cultivated crop; (2) tomatoes; (3) oats; (4) wheat or hay; (5) hay. If tomatoes had not been grown, the crops which the farmers most commonly reported they would have grown were: corn, 25; oats, 8; cabbage, 7; potatoes, 6. Corn and oats ordinarily are not very profitable crops in New York. In 1920, outside of some truck crops such as cucumbers and melons which some of the growers reported they would have grown, probably none of the crops mentioned would have given as large a return per hour of labor as tomatoes.

It is sometimes stated that tomatoes are valuable in the rotation due to their effect on the yield of following crops. Since in New York no crop is so generally grown after tomatoes as is wheat after peas, it was impossible to obtain comparable information as to this effect of tomatoes on the same crop on different farms. The farmers' answers to the question as to what effect they had noticed in the yields of crops following tomatoes were as follows: good, 51; none, 51; bad, 16; no experience, 14. The good effects were generally ascribed to the heavy fertilization given to the tomato crop.

VARIATIONS IN THE COST OF PRODUCING TOMATOES

The variations in the cost of producing tomatoes on the 133 farms are shown in table 58. Between 75 and 80 per cent of the total tonnage

was produced at or below a cost of from $21 to $22 a ton. This tonnage was grown by 61 per cent of the producers on 64 per cent of the acreage.

TABLE 58. RANGE OF COSTS OF PRODUCING TOMATOES ON 133 FARMS IN 1920

Cost per ton	Number of farms	Per cent of total farms	Per cent of farms at this cost or lower	Acres	Per cent of total acres	Per cent of acres at this cost or lower	Tons	Per cent of total tons	Per cent of tons at this cost or lower	Yield per acre (tons)
$10	3	2.3	2.3	17.0	2.8	2.8	319	6.1	6.1	18.8
11	4	3.0	5.3	16.6	2.8	5.6	241	4.6	10.7	14.5
12	1	0.7	6.0	2.5	0.4	6.0	234	0.6	11.3	13.6
13	8	6.0	12.0	40.0	6.6	12.6	415	7.9	19.2	10.4
14	10	7.5	19.5	39.0	6.5	19.1	457	8.7	27.9	11.7
15	9	6.8	26.3	46.8	7.8	26.9	544	10.4	38.3	11.6
16	5	3.8	30.1	17.8	3.0	29.8	241	4.6	42.9	13.5
17	11	8.3	38.3	70.0	11.6	41.5	680	13.0	55.9	9.7
18	12	9.0	47.4	37.8	6.3	47.7	348	6.6	62.5	9.2
19	7	5.3	52.6	48.5	8.1	55.8	394	7.5	70.0	8.1
20	6	4.5	57.1	25.5	4.2	60.0	202	3.8	73.8	7.9
21	5	3.8	60.9	23.5	3.9	63.9	193	3.7	77.5	8.2
22	6	4.5	65.4	25.0	4.2	68.1	174	3.3	80.8	7.0
23	7	5.3	70.7	37.7	6.3	74.3	265	5.1	85.9	7.0
24	6	4.5	75.2	20.5	3.4	77.7	168	3.2	89.1	8.2
25	4	3.0	78.2	14.5	2.4	80.2	97	1.8	90.9	6.7
26	2	1.5	79.7	12.0	2.0	82.1	64	1.2	92.2	5.3
27	2	1.5	81.2	4.0	0.7	82.8	23	0.4	92.6	5.8
28	1	0.7	82.0	2.0	0.3	83.1	13	0.2	92.9	6.5
29	3	2.3	84.2	15.0	2.5	85.6	65	1.2	94.1	4.3
30	2	1.5	85.7	7.0	1.2	86.8	32	0.6	94.7	4.6
31	1	0.7	86.5	3.0	0.5	87.3	14	0.3	95.0	4.7
32	3	2.3	88.7	6.5	1.1	88.4	35	0.7	95.6	5.4
33	1	0.7	89.5	6.0	1.0	89.4	31	0.6	96.2	5.2
34	3	2.3	91.7	7.2	1.2	90.6	41	0.8	97.0	5.7
35	2	1.5	93.2	9.0	1.5	92.1	46	0.9	97.9	5.1
38	1	0.7	94.0	2.3	0.4	92.4	9	0.2	98.1	3.9
40	2	1.5	95.5	23.5	3.9	96.3	55	1.0	99.1	2.3
41	1	0.7	96.2	5.0	0.8	97.2	15	0.3	99.4	3.0
45	1	0.7	97.0	3.0	0.5	97.7	14	0.3	99.7	4.7
47	1	0.7	97.7	2.0	0.3	98.0	5	0.1	99.8	2.5
60+	3	2.3	100.0	12.0	2.0	100.0	13	0.2	100.0	1.1
All farms	133	100.0	.....	602.2	100.0	.....	5,247	100.0	.....	.....

LABOR REQUIREMENTS

The time required to perform the various operations on the tomato crop is shown in table 59. The hours given are not the average time for

TABLE 59. AVERAGE HOURS PER ACRE REQUIRED TO PERFORM VARIOUS OPERATIONS ON THE TOMATO CROP ON 133 FARMS GROWING 602.2 ACRES IN 1920

Operation	Number of times operation was performed	Man hours	Horse hours	Tractor hours	Automobile miles	Truck hours
Plowing	.....	5.5	11.5	0.3	.....	.....
Harrowing:						
Spring-tooth	3.9	4.1	9.2	0.2	.....	.....
Spike-tooth	0.1	0.2	0.4	.....	.....	.....
Disking	0.7	0.9	1.7	0.2	.....	.....
Rolling	1.5	1.0	2.0	.....	.....	.....
Planking	0.2	0.2	0.4	.....	.....	.....
Cultipacking	0.1	0.1	0.3	.....	.....	.....

TABLE 59 (*continued*)

Operation	Number of times operation was performed	Man hours	Horse hours	Tractor hours	Automobile miles	Truck hours
Putting in cover crop	.....	0.1	0.1	.....	.....	.....
Hauling fertilizer	.....	0.7	1.2	.....	.....	.....
Applying fertilizer	.....	3.0	1.5	.....	.....	.....
Hauling plants	.....	2.2	3.7	.....	0.2	0.2
Taking care of plants	.....	0.8	.....	.....	.....	.....
Hauling water	.....	0.1	0.1	.....	.....	.....
Marking	.....	1.0	1.0	.....	.....	.....
Setting	.....	18.3	4.3	.....	.....	.....
Resetting	.....	1.5	.....	.....	.....	.....
Returning flats	.....	0.5	0.9	.....	0.1	.....
Cultivating:						
Two-horse	2.3	3.4	6.8	.....	.....	.....
One-horse	3.3	10.7	10.7	.....	.....	.....
Hoeing	.....	4.3	.....	.....	.....	.....
Weeding	.....	0.7	.....	.....	.....	.....
Supervising	.....	0.1	.....	.....	.....	.....
Hauling and spreading manure	.....	2.5	5.1	.....	.....	.....
Hauling help for setting	.....	.....	.....	.....	0.2	.....
Summer fallowing	.....	0.1	0.2	.....	.....	.....
Total growing	.....	62.0	61.1	0.7	0.5	0.2
Harvesting early crop	.....	1.5	0.2	.....	0.1	0.1
Hauling crates	.....	1.6	2.6	.....	0.2	0.2
Picking for factory	.....	79.9	.....	.....	.....	.....
Hauling	.....	18.9	33.9	.....	.....	1.7
Hauling pickers	.....	0.3	.....	.....	2.8	.....
Returning empty crates	.....	0.3	0.5	.....	.....	.....
Making extra trips	.....	0.2	0.2	.....	0.2	.....
Total harvesting	.....	102.7	37.4	.....	3.3	2.0
Total labor	.....	164.7	98.5	0.7	3.8	2.2

those doing the work, but were obtained by dividing the total number of hours spent on the operation by the total number of acres. The average hours required for performing a particular operation once may be obtained by dividing the average hours as given, by the number of times the operation was performed.

The land is plowed and fitted carefully, spring-tooth, spike-tooth, and disk harrows and rollers being most commonly used according to the nature of the soil. Different methods are used in applying fertilizer. The more common of these are with a grain drill and by hand after the plants are set. A method used by a few growers is to drill the fertilizer in the row with a potato planter, which at the same time makes a furrow in which the plants may be set. The time and the cost of performing this operation by these three methods are shown in table 60. The most economical method is with a grain drill. The use of a potato planter usually saves

marking one way. A few growers who made heavy applications of fertilizer drilled a part and put the remainder in the row with a potato planter.

TABLE 60. HOURS REQUIRED, AND COST OF APPLYING FERTILIZER PER ACRE, BY DIFFERENT METHODS, 1920

Method of application	Number of farms	Average quantity of fertilizer per acre (pounds)	Hours per acre applying fertilizer		Cost per acre of applying fertilizer*
			Man	Horse	
By hand after plants were set	59	497	5.4	.....	$2.27
Drilled	38	574	1.4	2.6	1.44
In row with potato planter	7	865	2.5	5.0	2.68

* Labor was charged at the average cost on all farms, 42 cents per hour for man labor, 24.5 cents for horse labor, and 8.2 cents for use of equipment.

The plants are most commonly set in checkrows from 3 to 4 feet apart. Hand-setting is the most usual method, altho on some farms a planter is employed. The relative cost of the two methods is shown in table 61. The time required to mark out also is saved when a machine is used. When the plants are set by hand, the rows are usually furrowed out with a cultivator or a shovel plow.

TABLE 61. HOURS REQUIRED, AND COST OF SETTING BY DIFFERENT METHODS, 133 FARMS, 1920

Method of setting	Number of farms	Acres of tomatoes per farm	Yield per acre (tons)	Hours per acre setting		Cost per acre setting*
				Man	Horse	
By machine	38	4.8	8.4	12.7	7.4	$7.75
By hand	95	4.4	8.8	20.7	3.0	9.67

* Labor was charged at the average cost on all farms, 42 cents per hour for man labor, 24.5 cents for horse labor, and 8.2 cents for use of equipment.

Two-horse cultivators were used to a greater extent than one-horse cultivators. The average time per acre for each cultivation was 1.5 hours when two horses were used and 3.3 hours when one horse was used. At the average labor rates, the cost was about 80 cents per acre less for each cultivation when two horses were used.

The time required to perform the various operations in growing tomatoes is combined into four groups in table 62. The man hours per acre were slightly lower in the Chautauqua area than in the Orleans area, and the horse hours were considerably lower. The greater use of tractors in the Chautauqua area accounts for part of this difference. In the Chautauqua area, tomatoes are grown on land that requires less fitting than

in the other areas, the soils in general being lighter. The difference in the quantity of manure used per acre accounts for the variation in the time required to haul and spread manure. The hours in the Niagara area were the highest of the three sections for each group of operations except plowing and fitting, due to the smaller acreages grown.

TABLE 62. HOURS REQUIRED TO PERFORM VARIOUS GROUPS OF OPERATIONS GROWING TOMATOES IN THE DIFFERENT AREAS IN 1920

Operations	Hours per acre					
	Orleans		Niagara		Chautauqua	
	Man	Horse	Man	Horse	Man	Horse
Plowing and fitting*.....	12.7	31.7	14.7	28.7	10.7	19.8
Setting, etc.....	27.6	12.9	29.0	15.7	28.4	11.3
Cultivating, etc.....	18.9	17.6	19.9	20.6	19.0	16.0
Hauling manure.....	3.1	6.7	3.7	7.0	1.4	2.8
Total labor for growing.....	62.3	68.9	67.3	72.0	59.5	49.8

* In addition to the figures given, tractors were used an average of 0.3 hour per acre in the Orleans area and an average of 1 hour per acre in the Niagara and Chautauqua areas.

The crates or baskets for the tomatoes are furnished by the companies. The Heinz Company furnishes a conical-shaped basket holding about five-eighths of a bushel. This is the commonest type of container in the Chautauqua area. The crates generally used in the other areas hold about the same quantity. The time required to pick and haul a ton of tomatoes in the various areas is given in table 63. While the hours per ton were higher in the Chautauqua area than in the Orleans area, the cost per ton was practically the same because of the lower cost of labor per hour.

TABLE 63. AVERAGE LABOR REQUIREMENTS PER TON HARVESTING TOMATOES, ON 133 FARMS IN 1920

	Orleans	Niagara	Chautauqua	All farms
Man hours per ton picking.....	7.6	10.0	10.4	9.2
Man hours per ton hauling.....	2.2	2.5	2.0	2.2
Horse hours per ton hauling.....	3.9	4.6	3.5	3.9
Truck hours per ton hauling.....	0.2	0.2	0.2	0.2
Man hours per ton for total harvesting.	10.1	13.0	12.9	11.8
Horse hours per ton for total harvesting.	4.4	5.4	3.6	4.3
Truck hours per ton for total harvesting.	0.2	0.2	0.3	0.2
Cost of harvesting per ton.....	$6.44	$8.07	$6.51	$6.79
Miles to receiving station.....	3.4	3.1	2.3	2.9

Estimates of the time lost in waiting at the receiving point to unload tomatoes were obtained, The average length of time lost per acre was estimated to have been 4.2 hours in the Orleans area, 3.2 hours in the

Niagara area, and 4 hours in the Chautauqua area. This time was included in the length of time spent in hauling. The tonnage of tomatoes which the canning companies were required to handle was above normal and a certain amount of delay was unavoidable. In the Niagara area, where the tomatoes for the most part were delivered at loading stations to be shipped to Rochester, a number of extra trips had to be made to get crates. The hours per acre hauling crates in the Niagara area and the adjoining area, Orleans, with substantially the same yield, were as follows:

	Man hours	Horse hours	Truck hours
Niagara	4.0	6.2	0.8
Orleans	1.7	3.2	.....

At the rates at which it was charged, the extra labor spent in the Niagara area amounted to over $3 an acre.

FACTORS AFFECTING THE COST OF PRODUCTION OF TOMATOES

Yield per acre

The yield per acre is probably the most important single factor affecting the cost per ton in the production of tomatoes. The relation between the yield per acre and the profits is shown in table 64. The costs in detail for each yield group are given in table 65.

TABLE 64. RELATION BETWEEN YIELD OF TOMATOES PER ACRE, AND RETURNS ABOVE THE COST OF HARVESTING, 133 FARMS, 1920*

Yield per acre (tons)	Number of farms	Average yield per acre (tons)	Average growing cost per acre	Increase in growing cost per acre over lowest-yielding group	Return per acre above cost of harvesting	Increase in return per acre above cost of harvesting, over group with lowest yield per acre†
Less than 8	55	5.5	$101	.....	$ 73	.....
8–11	47	9.4	104	$ 3	138	$ 65
Over 11	31	14.3	116	15	219	146

*The correlation coefficient between the yield per acre and the cost per ton was − 0.335 ± 0.052.
† A small part of this increase was due to the fact that more of the farms in the higher-yielding groups were located in the Orleans and Niagara areas, where a higher price was paid per ton.

The growing cost per acre increased only $3 between the farms that had yields of less than 8 tons per acre and those that had yields of from 8 to 11 tons per acre. However, there was an increase in the average yield per acre of 3.9 tons, and of $65 in the return per acre above the cost of harvesting, between those two groups of farms. The increase in the growing cost per acre was only $15 between the lowest- and the highest-yielding group, while the increase in the return above the cost of harvesting amounted to $146 per acre.

TABLE 65. AVERAGE COST OF PRODUCING AN ACRE OF TOMATOES ON FARMS WITH DIFFERENT YIELDS PER ACRE, 1920.

Item	Yield less than 8 tons per acre, 55 farms, 256.8 acres, averaging 5.5 tons per acre		Yield 8 to 11 tons per acre, 47 farms, 224.5 acres, averaging 9.4 tons per acre		Yield over 11 tons per acre, 31 farms, 120.9 acres, averaging 14.3 tons per acre	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Plants	3,501	$21.69	3,209	$21.56	3,425	$23.34
Fertilizer	570 lbs.	12.30	639 lbs.	14.30	600 lbs.	13.83
Manure charged to tomatoes	2 tons	4.30	3.1 tons	6.22	4.9 tons	10.36
Labor growing tomatoes:						
Human	63.2 hrs.	25.82	58.0 hrs.	24.41	67.0 hrs.	29.92
Horse	58.2 hrs.	14.26	60.4 hrs.	14.86	68.3 hrs.	16.73
Use of equipment	58.2 hrs.	4.77	60.4 hrs.	4.97	68.3 hrs.	5.60
Use of tractor	1.0 hr.	1.66	0.6 hr.	1.00	0.6 hr.	1.13
Use of automobile and truck		0.61		0.22		0.59
Miscellaneous growing expenses		0.29		0.30		0.04
Interest on growing costs		1.91		2.03		2.30
Use of land		13.73		14.46		11.74
Total growing cost		$101.34		$104.33		$115.58
Labor harvesting tomatoes:						
Human	74.9 hrs.	$30.31	107.6 hrs.	$43.98	152.7 hrs.	$66.11
Horse	25.8 hrs.	6.33	38.9 hrs.	9.54	58.9 hrs.	14.43
Use of equipment	25.8 hrs.	2.12	38.9 hrs.	3.19	58.9 hrs.	4.83
Use of automobile and truck		2.63		3.76		4.17
Miscellaneous harvesting expenses		0.49		0.59		0.81
Interest on harvesting costs		0.37		0.53		0.85
Total harvesting cost		$42.25		$61.59		$91.20
Total cost of crop		$143.59		$165.92		$206.78
Tomatoes disposed of other than to factory	0.10 ton	$ 2.98	0.06 ton	$ 2.03	0.08 ton	$ 2.18
Tomatoes sold to factory	5.38 tons	111.83	9.38 tons	197.54	14.18 tons	308.09
Total receipts from tomatoes *	5.48 tons	$114.81	9.44 tons	$199.57	14.26 tons	$310.27
Price received per ton		$20.95		$21.14		$21.76
Cost per ton growing		$18.49		$11.06		$ 8.10
Cost per ton harvesting		7.71		6.52		6.40
Total cost per ton		$26.20		$17.58		$14.50
Return per hour of human labor		$0.20		$0.62		$0.91

* The estimated tonnage per acre not harvested for the three groups was as follows: with yield less than 8 tons, 3.2 tons; with yield from 8 to 11 tons, 2.2 tons; with yield over 11 tons, 2.5 tons.

The average land cost per acre was lower in the highest-yielding group than in the other two groups. A large proportion of the farms in this group were located in the Orleans and Niagara areas (table 66), where the land had a lower value per acre than in the Chautauqua area. Land values are based, not on superiority for producing tomatoes alone, but on advantages for producing a variety of crops. The advantage of a particular location for tomatoes will vary from year to year. When the delivery of the crop was cut down in 1920, the growers on the lighter

sandy and gravelly soils had a larger proportion of their tomatoes harvested than did the growers on the silt and clay loam soils. An early frost would operate in the same way. Also, a dry year would give the greater advantage to the heavy soils, and a wet year to the lighter soils. The value of land does not represent the advantage that a particular kind of land may have in any one year.

TABLE 66. FARMS IN EACH AREA WITH DIFFERENT YIELDS OF TOMATOES, 1920

Yield per acre (tons)	Orleans	Niagara	Chautauqua	All farms
Less than 8	19	13	23	55
8–11	15	17	15	47
Over 11	15	13	3	31
All farms	49	43	41	133

The proportion of tomatoes produced on farms with different yields per acre is given in table 67. Forty-two per cent of the farms having yields of less than 8 tons of tomatoes per acre produced only 27 per cent of the total tonnage of tomatoes.

TABLE 67. PROPORTION OF TOMATOES PRODUCED ON FARMS WITH DIFFERENT YIELDS PER ACRE, 133 FARMS, 1920

Yield per acre (tons)	Number of farms	Per cent of total farms	Number of acres	Per cent of total acres	Number of tons	Per cent of total tons
Less than 8	55	42	256.8	43	1,406	27
8–11	47	35	224.5	37	2,118	40
Over 11	31	23	120.9	20	1,723	33
All farms	133	100	602.2	100	5,247	100

Some factors have considerable influence on the yield per acre but do not increase the cost of production. Some of these are, setting plants and cultivating at just the right time and in the proper manner, and favorable weather conditions. Certain other practices increase yields but also increase costs. Whether or not these are profitable depends on whether the value of the increased yield is greater than the cost of the practice.

Acres of tomatoes per farm

Most of the growers raise small acreages of tomatoes (table 68). In the Niagara area, none of the farmers interviewed grew more than 5 acres. In the Chautauqua area there were a considerable number of growers who had fairly large acreages.

While the farmers growing small acreages are more numerous, a comparatively few who grow larger acreages raise a considerable proportion

TABLE 68. FARMS GROWING DIFFERENT ACREAGES OF TOMATOES IN EACH AREA IN 1920

Acres of tomatoes per farm	Orleans	Niagara	Chautauqua	All farms
2 or less	14	20	5	39
2.1–3	8	15	7	30
3.1–4	11	6	6	23
4.1–5	5	2	3	10
5.1–6	1	.....	6	7
6.1–7	3	.....	5	8
7.1–8	3	.....	1	4
8.1–9	.....	.....	1	1
10	2	.....	1	3
14	.....	.....	1	1
15	1	.....	1	2
18	.....	.....	3	3
20	1	.....	1	2
Total	49	43	41	133
Acres per farm	4.5	2.7	6.5	4.5

of the total crop (table 69). The 92 farms on which 4 acres or less were grown made up 69 per cent of the total number of farms but grew only 41 per cent of the total tonnage of tomatoes.

TABLE 69. PROPORTION OF TOMATOES PRODUCED ON FARMS GROWING DIFFERENT ACREAGES, 133 FARMS, 1920

Acres of tomatoes per farm	Number of farms	Per cent of farms	Acres of tomatoes	Per cent of acres	Tons of tomatoes	Per cent of tons
4 or less	92	69	250.1	41	2,189	41
4.1–7	25	19	143.6	24	1,142	22
Over 7	16	12	208.5	35	1,916	37
All farms	133	100	602.2	100	5,247	100

The relation between the acres of tomatoes per farm and the cost of production is shown in table 70. The farms that grew over 7 acres had

TABLE 70. RELATION BETWEEN ACRES OF TOMATOES PER FARM AND COST OF PRODUCTION, 133 FARMS, 1920

Acres of tomatoes per farm	Number of farms	Average number of acres per farm	Average yield per acre (tons)	Growing cost per acre	Hours per acre growing		Man hours per ton harvesting	Harvesting cost per ton	Average distance to receiving point (miles)
					Man	Horse			
4 or less	92	2.7	8.8	$108	68.0	71.5	12.3	$7.59	3.5
4.1–7	25	5.7	8.0	103	61.0	59.6	11.3	6.77	2.3
Over 7	16	13.0	9.2	103	55.4	49.5	11.5	5.92	2.8
All farms	133	4.5	8.7	$105	62.0	61.1	11.8	$6.80	3.2

the highest average yield per acre. The larger acreages were probably grown on land better adapted to tomatoes, and perhaps better methods of production were followed. The man and horse hours per acre growing the crop, and the cost of harvesting a ton, decreased as the acreage increased. The difference in the hours per ton harvesting did not account for all the difference in cost. A larger proportion of the picking on the smaller acreages was done by family labor, which was charged at a higher rate than hired labor.

Distance to receiving point

A considerable proportion of the tomatoes were produced on farms that had to haul the tomatoes four miles or more (table 71).

TABLE 71. PROPORTION OF TOMATOES PRODUCED AT DIFFERENT DISTANCES FROM THE RECEIVING POINT, 133 FARMS, 1920

Distance from farm to receiving point (miles)	Number of farms	Per cent of total farms	Number of acres	Per cent of total acres	Number of tons	Per cent of total tons
Less than 2	34	25	158.7	26	1,365	26
2–3.9	46	35	256.8	43	2,128	41
4 and over	53	40	186.7	31	1,754	33
All farms	133	100	602.2	100	5,247	100

The expense for hauling increased with the distance (table 72). The land charge decreased. The decrease in the charge for use of land on the most distant group of farms was equal to the increased cost of hauling about 6.5 tons.

TABLE 72. RELATION BETWEEN DISTANCE TO RECEIVING POINT, COST OF HAULING TOMATOES, AND CHARGE FOR USE OF LAND, 133 FARMS, 1920

Distance to receiving point (miles)	Number of farms	Average distance (miles)	Yield of tomatoes per acre (tons)	Hauling per acre			Cost of hauling per ton	Charge per acre for use of land
				Man hours	Horse hours	Cost of truck use		
Less than 2	34	1.1	8.6	17.4	33.4	$0.36	$2.15	$15.13
2–3.9	46	2.7	8.3	17.0	31.2	2.35	2.36	14.70
4 and over	53	5.0	9.4	22.7	38.1	4.69	2.82	10.80

COMPARISON OF DATA OBTAINED BY THE ACCOUNTING AND SURVEY METHODS

The costs per acre are given in detail in table 73 for the farms on which accounts were kept and those on which data were obtained by the survey method. Higher yields were obtained on the farms in the former group. The hours of labor per acre for growing were lower on the farms which

kept accounts. This is due to a number of causes: larger acreages were grown; a larger number of the farms were located in the Orleans and Chautauqua areas, where the hours per acre were, on the average, lower; tractors and other labor-saving machines were used to a greater extent; the farms were a selected group of farms, on which the general efficiency might be expected to be better.

TABLE 73. AVERAGE COST OF PRODUCING AN ACRE OF TOMATOES IN 1920 ON FARMS ON WHICH ACCOUNTS WERE KEPT ON THE CROP, AND ON FARMS ON WHICH COST FIGURES WERE OBTAINED BY THE SURVEY METHOD

Item	Accounts — 26 farms, 131.8 acres, averaging 10.3 tons per acre		Records — 107 farms, 470.4 acres, averaging 8.3 tons per acre	
	Quantity per acre	Cost per acre	Quantity per acre	Cost per acre
Plants	3,435	$23.38	3,361	$21.55
Fertilizer	664 lbs.	15.01	584 lbs.	12.89
Manure charged to tomatoes	3.6 tons	8.07	2.9 tons	5.72
Labor growing tomatoes:				
Human	51.8 hrs.	21.57	64.9 hrs.	27.38
Horse	53.2 hrs.	13.03	63.3 hrs.	15.53
Use of equipment	53.2 hrs.	4.36	63.3 hrs.	5.20
Use of tractor	1.0 hr.	1.75	0.7 hr.	1.18
Use of automobile and truck		0.55		0.44
Miscellaneous growing expenses		0.29		0.24
Interest on growing costs		1.95		2.06
Use of land		13.15		13.73
Total growing cost		$103.11		$105.92
Labor harvesting tomatoes:				
Human	112.8 hrs.	$44.61	100.0 hrs.	$42.02
Horse	34.5 hrs.	8.45	38.2 hrs.	9.35
Use of equipment	34.5 hrs.	2.83	38.2 hrs.	3.13
Use of automobile and truck		5.67		2.71
Miscellaneous harvesting expenses		0.65		0.58
Interest on harvesting costs		0.58		0.51
Total harvesting cost		$62.79		$58.30
Total cost of crop		$165.90		$164.22
Tomatoes disposed of other than to factory	0.08 ton	$ 2.67	0.08 ton	$ 2.41
Tomatoes sold to factory	10.26 tons	218.64	8.18 tons	173.24
Total receipts from tomatoes	10.34 tons	$221.31	8.26 tons	$175.65
Price received per ton		$21.40		$21.27
Cost per ton growing		$9.97		$12.82
Cost per ton harvesting		6.07		7.06
Total cost per ton		$16.04		$19.88

COST OF PRODUCING TOMATOES IN OTHER STATES IN 1920

New Jersey

The New Jersey Agricultural Experiment Station has obtained information on the cost of producing tomatoes in southern New Jersey for the years 1918, 1919, and 1920. The average costs of growing tomatoes in 1920 in that section are given in table 74.[5] The yield per acre was lower and the cost per ton was higher than in New York. The expense

TABLE 74. COST PER ACRE OF PRODUCING CANNING TOMATOES ON 205 FARMS IN NEW JERSEY GROWING 2040.25 ACRES OF TOMATOES IN 1920

Item	Quantity per acre	Cost per acre
Cost of hotbed material	.....	$ 0.16
Seed	.....	0.61
Plants	1,338*.....	3.26
Cover-crop seed	28.2 lbs....	1.04
Fertilizer†	859 lbs.....	18.71
Manure†	7.74 tons....	16.28
Lime†	0.24 ton.....	0.66
Spray materials	.....	0.81
Labor growing tomatoes:		
Human	57.4 hrs.....	21.94
Horse	52.4 hrs.....	10.61
Use of equipment	52.4 hrs.....	3.67
Use of tractor	0.6 hr.....	0.92
Use of automobile and truck	.....	0.45
Insurance	.....	0.14
Interest	.....	2.00
Use of land	.....	11.30
Total growing cost	.....	$92.56
Labor harvesting tomatoes:		
Human	71.0 hrs.....	$27.16
Horse	28.3 hrs.....	5.72
Use of equipment	28.3 hrs.....	1.98
Use of truck	3.4 hrs.....	5.04
Hauling	.....	0.03
Baskets	23.4.....	3.13
Total harvesting cost	.....	$43.06
Total cost of crop	.....	$135.62
Yield per acre sold	5.74 tons....	.....
Yield per acre including unharvested tomatoes	6.07 tons....	.....
Cost per ton growing tomatoes sold	.....	$16.13
Cost per ton harvesting tomatoes sold	.....	7.50
Total cost per ton of tomatoes sold	.....	$23.63

* This is the number of plants purchased. Plants that were raised are not included.
† Quantity figures are for total applied. Cost figures are for proportion charged, which was influenced by rotation.

[5] New Jersey Agr. Exp. Sta., Bul. 353:52-53. 1921.

for seed and plants was considerably lower in New Jersey, because there tomato plants are grown in the field. The cost of both fertilizer and manure was higher in New Jersey than in New York. The combined expenses for plants, fertilizer, and manure in the two States were about equal. The man and horse hours per acre were lower in New Jersey. Larger acreages were grown per farm. The hours were a little higher than for New York farms growing over 7 acres (table 70).

Ohio

Cost figures on tomatoes were obtained in 1920 on 27 farms in Wood County, Ohio, by the Ohio State College of Agriculture. The accounting method was used. The average cost per acre on 26 of these farms is given in table 75:[6]

TABLE 75. AVERAGE COST OF PRODUCING AN ACRE OF TOMATOES ON 26 OHIO FARMS GROWING 185.7 ACRES IN 1920

Item	Quantity per acre	Cost per acre
Plants	2,248	$ 8.99
Fertilizer		2.40
Manure charged to crop	2.3 tons	7.90
Labor growing tomatoes:		
Human	34 hrs	15.96
Horse	34 hrs	7.33
Use of equipment	34 hrs	2.38
Use of tractor		3.07
Interest and taxes on land		17.68
Interest on growing expenses		1.58
Total growing cost		$67.29
Total harvesting cost		$33.46
Total cost of crop		$100.75
Yield per acre delivered	6.4 tons	
Yield per acre including unharvested tomatoes	8.1 tons	
Cost per ton growing tomatoes delivered		$10.51
Cost per ton harvesting tomatoes delivered		5.23
Total cost per ton of tomatoes delivered		$15.74

An average of 7.1 acres of tomatoes per farm was grown on the Ohio farms. The average yield harvested per acre was lower than on the New York farms, and about the same proportion of the crop was not harvested. Very little fertilizer was used. The manure was charged at from $3 to $4 per ton.

The hours of human and horse labor were less than in New York. The costs given were for farmers keeping accounts on the crop, therefore they might be expected to be lower than for average farms. Also, the acreage of tomatoes per farm was fairly large. Tractors were used on

[6] Adapted from a mimeographed report by R. F. Taber.

42 per cent and machine setters on 81 per cent of the farms. Fewer plants and less fertilizer and manure were used per acre than in New York. Less time was required to haul these materials, to set the plants, to apply the fertilizer, and to spread the manure. The majority of the farmers used two-horse cultivators and cultivated only three or four times. More of the growers in New York used one-horse cultivators and cultivated five or six times. The land in this part of Ohio can be prepared for planting in less time than is required on New York farms, because the soil is more easily worked. Natural advantages, such as a more easily worked soil or land capable of producing high yields per acre without heavy applications of fertilizer, are likely to be offset, in part at least, by higher land value.

SWEET CORN

The most important States in the production of sweet corn for canning are the Middle-Western States of Iowa and Illinois. However, a considerable quantity of corn is packed in the Eastern States, particularly in Maryland, Maine, and New York. The high quality of corn grown in a cool climate explains the importance of corn canning in States that are not ordinarily considered as important corn-producing States. The location of the factories canning corn in New York State in 1920 is shown in figure 5. Data on the cost of producing sweet corn were obtained in

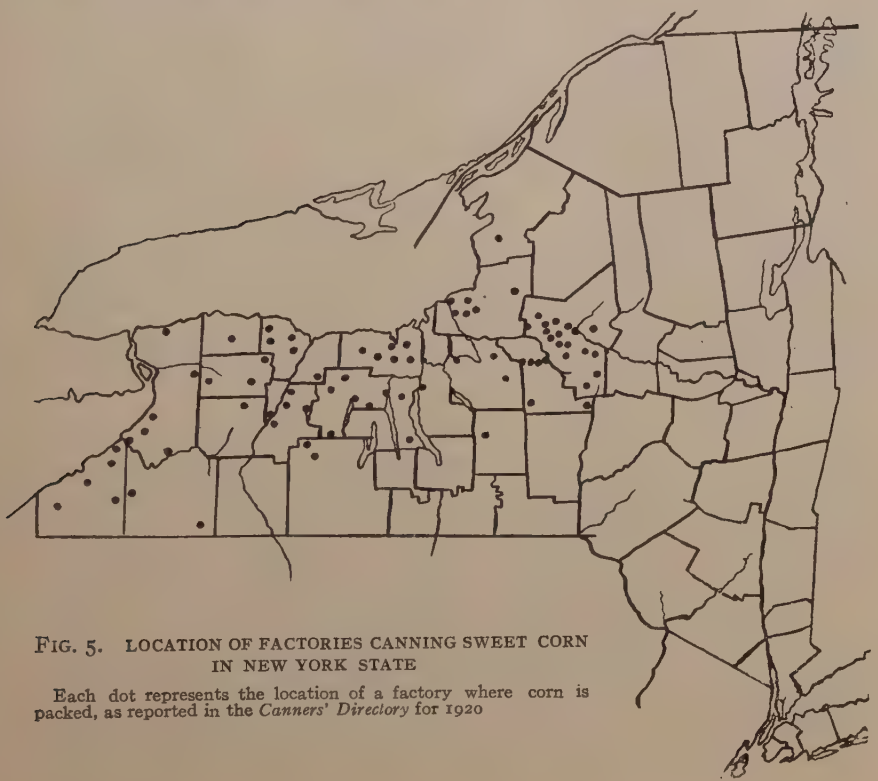

FIG. 5. LOCATION OF FACTORIES CANNING SWEET CORN IN NEW YORK STATE

Each dot represents the location of a factory where corn is packed, as reported in the *Canners' Directory* for 1920

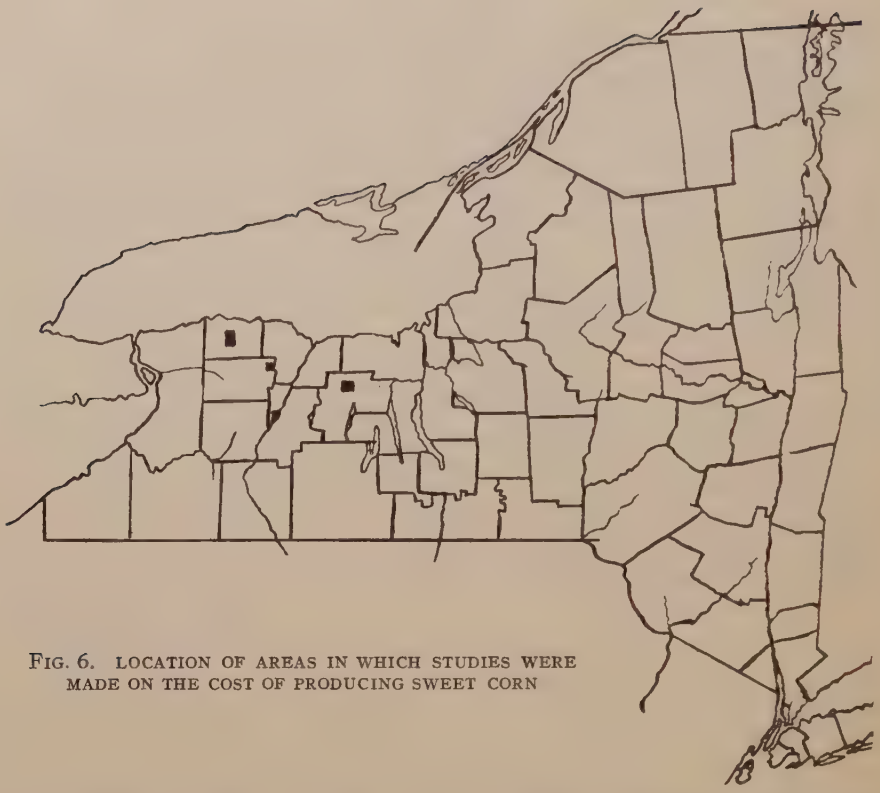

FIG. 6. LOCATION OF AREAS IN WHICH STUDIES WERE MADE ON THE COST OF PRODUCING SWEET CORN

three areas — Orleans, Ontario, and Livingston. Accounts were kept on nine farms in Orleans and Genesee Counties; this area is designated as the Orleans area. Cost figures were obtained on twelve farms in northwestern Ontario County. Records were obtained by the survey method on thirteen farms located on the Genesee River flats between Geneseo and Mount Morris in Livingston County. The location of these areas is shown in figure 6.

AGRICULTURAL CONDITIONS IN THE AREAS STUDIED

The agricultural conditions in these three sections differ somewhat. The most important crops grown on the farms in the Orleans area were apples, winter wheat, hay, and various crops for canning factories. The most important crops grown in the Ontario area were winter wheat, hay, alfalfa, apples, potatoes, and peas and sweet corn for the canning factory. The topography is rolling, and the soils are principally loams and sandy loams well drained and well supplied with lime. In the Livingston area the most important crops were peas and sweet corn for the canning factory, winter wheat, hay, and beans. This area is located on the level land along the Genesee River. The soil is a silt loam, very deep and productive. Most of this land is subject to over-flow nearly every year. In July of 1920 a considerable proportion of the land in sweet corn in this area was flooded.

TABLE 76. AVERAGE COST OF PRODUCING AN ACRE OF SWEET CORN IN 1920 IN DIFFERENT AREAS

Item	On 9 farms in the Orleans area growing 59.3 acres			On 12 farms in the Ontario area growing 87.2 acres			On 13 farms in the Livingston area growing 388 acres		
	Quantity per acre	Cost per acre	Per cent of total cost	Quantity per acre	Cost per acre	Per cent of total cost	Quantity per acre	Cost per acre	Per cent of total cost
Seed	0.23 bu...	$ 1.64	2.9	0.34 bu...	$ 2.02	3.0	0.32 bu...	$ 1.93	3.5
Fertilizer	146 lbs.....	2.28	4.0	136 lbs.....	2.04	3.1	2 lbs.....	0.04	0.1
Manure charged to sweet corn	2.0 tons...	4.01	7.0	2.7 tons...	5.41	8.1	0.9 ton....	1.84	3.4
Labor growing sweet corn:									
Human	25.9 hrs....	11.64	20.2	29.2 hrs....	12.22	18.4	44.1 hrs....	14.72	26.8
Horse	44.0 hrs....	10.77	18.8	47.3 hrs....	11.57	17.3	37.7 hrs....	9.24	16.8
Use of equipment	44.0 hrs....	3.61	6.3	47.3 hrs....	3.87	5.8	37.7 hrs....	3.09	5.6
Use of tractor	1.3 hrs....	2.24	3.9	2.1 hrs....	3.66	5.5	0.9 hr....	1.52	2.8
Use of automobile and truck	.....	0.12	0.2	.....	.....	.....	.....	0.01	.....
Interest on growing costs	.....	1.01	1.8	.....	0.95	1.4	.....	0.76	1.4
Use of land	.....	9.50	16.6	.....	8.76	13.1	.....	10.16	18.5
Total growing cost	.....	$46.82	81.7	.....	$50.50	75.7	.....	$43.31	78.9
Labor harvesting sweet corn:*									
Human	13.6 hrs....	$6.61	11.5	22.7 hrs....	$9.42	14.3	20.8 hrs...	$7.22	13.2
Horse	10.9 hrs....	2.66	4.6	15.9 hrs....	3.90	5.8	13.0 hrs...	3.20	5.8
Use of equipment	10.9 hrs....	0.89	1.6	15.9 hrs....	1.30	1.9	13.0 hrs...	1.07	2.0
Use of automobile and truck	.....	0.18	0.3	.....	1.49	2.2	.....	.....	.....
Miscellaneous harvesting expenses	.....	0.10	0.2	.....	.....	.....	.....	.....	.....
Interest on harvesting costs	.....	0.08	0.1	.....	0.08	0.1	.....	0.06	0.1
Total harvesting costs *	.....	$10.52	18.3	.....	$16.19	24.3	.....	$11.55	21.1
Total cost of crop	.....	$57.34	100.0	.....	$66.69	100.0	.....	$54.86	100.0
Value of miscellaneous receipts with harvesting costs deducted *	.....	11.70	20.4	.....	11.43	17.1	.....	9.37	17.1
Net cost of sweet corn	.....	$45.64	79.6	.....	$55.26	82.9	.....	$45.49	82.9
Value of sweet corn†	1.7 tons....	$42.93	.....	3.4 tons....	$79.11	.....	2.7 tons....	$54.20	.....
Price received per ton†	.....	$25.00	.....	.....	$23.27	.....	.....	$20.07	.....
Net cost per ton†	.....	$26.85	.....	.....	$16.25	.....	.....	$16.85	.....

* Labor and all other costs for harvesting stalks are deducted from costs and from the estimated value of miscellaneous receipts in this table.
† Quantity given is for husked corn in the Orleans area and for unhusked corn in the Ontario and Livingston areas.

Two products, corn and stalks, are produced by the sweet-corn crop. The economical production of sweet corn requires that the stalks be used by some form of livestock. The Orleans and Ontario areas are not dairy sections. In the Livingston area dairying is more important, an average of twenty dairy cattle per farm being kept. A considerable number of sheep were kept in the Orleans and Ontario areas.

The common rotation in which sweet corn is grown on the upland soils in these areas is: (1) corn or some other cultivated crop for one or two years; (2) oats, barley, or peas; (3) wheat; (4) hay for one or two years. On the valley soils sweet corn is often grown on the same field for a number of years in succession. When the land is to be seeded down again, the succession of crops would be as indicated for the upland soils.

COST OF PRODUCTION

The average cost of producing one acre of sweet corn in 1920 on the farms visited in these three areas, is given in table 76.

Seed, fertilizer, and manure

Seed was a minor item in the cost of producing sweet corn. It was in all cases furnished by the factory. The usual rate of seeding was a peck to the acre. Fertilizer also was a minor item of cost. Acid phosphate was the fertilizer most generally used. The common rate of application was from 200 to 250 pounds per acre. Manure was a larger item of cost than fertilizer. Neither fertilizer nor manure was used extensively in the Livingston area on the land in sweet corn. This land is naturally very fertile. In all the areas, most of the manure charged to the sweet corn was applied directly to the 1920 crop.

Labor

The largest item of cost was labor. The rates at which the various classes of labor were charged in the different regions are given in table 77. The highest rates, both for hired and for family labor, were in the Orleans area. The high wages paid for help in this section during the season of 1920 are indicated by the rate of 50 cents per hour paid for " other hired labor " during harvesting. This wage was paid to women for picking

TABLE 77. RATES PER HOUR FOR DIFFERENT CLASSES OF LABOR ON SWEET CORN IN 1920

Class of labor	Orleans	Ontario	Livingston
Growing:			
Operators	$0.48	$0.48	$0.45
Sons over 16	0.50	0.40	0.40
Other family	0.30	.....	0.30
All family	0.48	0.47	0.43
Hired men	0.43	0.39	0.37
Other hired labor	0.40	.....	0.25
Total hired labor	0.42	0.39	0.31
Total growing	$0.45	$0.42	$0.33

TABLE 77 (*continued*)

Class of labor	Orleans	Ontario	Livingston
Harvesting:			
Operators	$0.48	$0.48	$0.44
Sons over 16	0.50	0.40	0.40
Other family	.....	0.19	0.30
All family	0.48	0.44	0.43
Hired men	0.48	0.40	0.36
Other hired labor	0.50	.....	0.24
Total hired labor	0.49	0.40	0.32
Total harvesting	$0.48	$0.42	$0.35

sweet corn. On the farms on which they were employed, a considerable acreage of sweet corn was not picked because it appeared more profitable to use the available help to harvest tomatoes and apples.

The proportion of the work performed by the different classes of labor is given in table 78. In the Orleans area a larger proportion of the growing work was done by family labor than in the other areas, due to the smaller farms and the fewer acres of crops grown per farm. A larger proportion of the harvesting labor was hired in the Orleans area. Since this was for the most part hand work and came at a very busy season, extra help was necessary. The help included under "Other hired labor" was

TABLE 78. PROPORTION OF WORK ON SWEET CORN PERFORMED BY DIFFERENT CLASSES OF LABOR, 1920

Class of labor	Per cent of work done		
	Orleans	Ontario	Livingston
Growing:			
Operators	45	30	13
Sons over 16	4	3	5
Other family	1	.....	2
All family	50	33	20
Hired men	33	67	40
Other hired labor	17	.....	40
Total hired labor	50	67	80
Total growing	100	100	100
Harvesting:			
Operators	33	27	20
Sons over 16	4	3	7
Other family	.....	4	1
All family	37	34	28
Hired men	41	66	46
Other hired labor	22	.....	26
Total hired labor	63	66	72
Total harvesting	100	100	100

the extra labor used to hoe and pick the corn. This class of help was used extensively on the farms in the Livingston area, where large acreages were grown.

Miscellaneous expenses

In the summary of costs, the expenses of harvesting fodder are omitted and credit is given for the estimated value of stalks less the cost of harvesting. The expenses for twine and for silo filling were therefore not included. The only item left under this heading was the fee collected by the grower's association on the farms in Genesee County included in the Orleans area.

Use of land

In the Livingston area over 80 per cent of the corn was grown on cash-rented land. The most usual rent paid was $10 per acre in addition to the taxes. The average charge per acre for the use of land was slightly higher in this area than in the Orleans and Ontario areas.

RETURNS

There are two sources of returns from sweet corn — the corn and the stalks. The principal return, however, is from the corn. There are two bases on which sweet corn is bought in New York State, the unhusked and the husked. When bought on the unhusked basis, the weight of the unhusked corn as drawn from the field is paid for. When bought on the husked basis, the loads as drawn in are weighed. A sample is taken from each load and husked. The percentage that the husked corn from this sample represents of the unhusked corn, is calculated. This percentage is applied to the whole load and the farmer is paid for the calculated weight of husked corn. This method is sometimes called *averaging*.

In the Orleans area the corn was bought on the husked basis. The growers from whom figures were obtained hauled into the factory 263,274 pounds of unhusked corn. They were paid for 199,382 pounds of husked corn. The percentage of husked corn, commonly known as the *test*, was 75.7. This corn was all of the Evergreen variety.

The low yield in the Orleans area was due to the complete failure of corn on two farms, and the fact that a large acreage on another farm was not harvested because of the pressure of other farm work. The average yield of unhusked corn on the harvested acreage was 3.35 tons per acre.

The price paid for corn of the Evergreen variety in the Orleans area was $25 per ton of husked corn, which, with a test of 75.7 per cent, was equivalent to a price of $18.92 for unhusked corn. In the Ontario area the prices paid per ton of unhusked corn for the different varieties were as follows: Evergreen and Hickox, $20; Golden Bantam, $32.50. The average yields per acre of these three varieties in this area in 1920 were: Evergreen, 7646 pounds; Hickox, 7240 pounds; Golden Bantam, 5326 pounds. With these yields and prices, the returns for corn alone from the Golden Bantam were more than the returns from the other two varieties. However, the fodder from the Golden Bantam is usually considered to be worth less per acre.

The average yield per acre and price per ton would vary with the proportion of the different varieties in the total acreage. The acreages of the different varieties grown are given in table 79:

TABLE 79. ACRES OF DIFFERENT VARIETIES OF SWEET CORN GROWN IN 1920

Variety	Orleans	Ontario	Livingston	Total
Evergreen	59.3	30.0	92.0	181.3
Early Crosby	.....	.....	110.0	110.0
Country Gentleman	.....	.....	47.0	47.0
Hickox	.....	28.0	20.0	48.0
Howling Mob	.....	.....	31.0	31.0
Golden Bantam	.....	29.2	15.0	44.2
Early Orange	.....	.....	45.0	45.0
Charlevoix	.....	.....	28.0	28.0
Total	59.3	87.2	388.0	534.5

Miscellaneous returns

The stalks may be used in various ways. Stock may be turned in and the stalks not cut, or the stalks may be cut and fed as dry fodder, or they may be put into silos. At the factories the husks and the cobs are stacked or put into silos. The growers usually have the privilege of buying the resulting ensilage at a cost of $2 or $3 per ton. Where the growers had this privilege, the estimated value of this material above the price paid and the cost of hauling was credited to the crop. The miscellaneous returns represent, therefore, the estimated value of the standing stalks plus the value above cost of the silage obtained from the factory (table 80). The value of stalks was less in the Livingston area because most of the stalks were not harvested until they had been badly frosted.

TABLE 80. MISCELLANEOUS RETURNS PER ACRE OF SWEET CORN IN 1920

Source of return	Orleans	Ontario	Livingston
Value of standing stalks	$10.40	$9.65	$6.13
Value of ensilage from factories, above cost to grower	1.30	1.78	3.24
Total	$11.70	$11.43	$9.37

LABOR REQUIREMENTS

The time spent on the various operations on the sweet-corn crop is given in table 81. The land is fitted for sweet corn in much the same manner as for any other cultivated crop. The greater part of the corn in the areas visited was planted with a two-horse corn planter. On several farms, particularly in the Ontario area, the corn was gone over with a weeder before it was cultivated. The average number of cultivations with a two-horse cultivator were: Orleans, 3; Ontario, 4.2; Livingston, 4. In addition to this, some cultivation was done with a one-horse cultivator, the average number of cultivations being: Orleans, 0.2; Ontario, 1.0; Livingston, 0.5. In the Livingston area the corn was practically all

TABLE 81. AVERAGE HOURS PER ACRE REQUIRED TO PERFORM VARIOUS OPERATIONS ON THE SWEET-CORN CROP IN 1920

Operation	21 farms in the Orleans and Ontario areas				13 farms in the Livingston area			
	Number of times operation was performed	Man hours	Horse hours	Tractor hours	Number of times operation was performed	Man hours	Horse hours	Tractor hours
Plowing	.....	5.4	13.3	0.6	.....	4.3	10.6	0.4
Harrowing	3.2	2.5	6.2	0.6	3.0	2.3	5.8	0.3
Disking	0.8	0.8	0.6	0.6	0.2	0.3	0.6	0.1
Rolling	1.0	0.7	1.4	.....	2.0	1.6	3.2	.....
Cultipacking	0.1	0.1	0.4	.....	0.1	0.1	0.3	.....
Hauling seed and fertilizer	.....	0.1	0.2	.....	.....	0.1	0.1	.....
Marking	0.3	0.4	0.4	.....	.....	.....	.....	.....
Planting	1.0	1.5	1.5	.....	1.0	0.9	1.8	.....
Replanting	.....	0.2	0.1	.....	.....	0.5	0.8	0.1
Weeding	0.7	0.7	1.3	.....	.....	.....	.....	.....
Cultivating:								
Two-horse	3.8	7.7	15.4	.....	3.9	5.8	11.6	.....
One-horse	0.5	1.2	1.2	.....	0.5	1.0	1.0	.....
Hoeing	.....	4.4	.....	.....	.....	25.4	.....	.....
Transporting extra help for hoeing	.....	.....	.....	.....	.....	0.1	0.2	.....
Supervising	.....	.....	.....	.....	.....	1.0	.....	.....
Hauling and spreading manure	.....	2.1	3.9	.....	.....	0.7	1.7	.....
Total	.....	27.8	45.9	1.8	.....	44.1	37.7	0.9
Acres of sweet corn per farm		7.0				29.8		

hoed. The land in this section is extremely good grass land, and the grass will grow as well in a cornfield as elsewhere unless measures are taken to keep it out. The time required to perform the various operations was similar in the Orleans and Ontario areas. More man hours per acre were required in the Livingston area because of the hoeing. Other operations were performed in less time in the Livingston area than in the other areas because of the larger acreages grown per farm. The hours required to harvest an acre and a ton of corn, and the cost per ton, are given in table 82:

TABLE 82. AVERAGE LABOR REQUIREMENTS HARVESTING SWEET CORN AND HAULING TO FACTORY IN 1920

	Orleans	Ontario	Livingston
Yield per acre (tons)*	2.2	3.4	2.7
Loads per acre	1.3	2.5	1.8
Distance to factory (miles)	1.8	1.3	2.9
Man hours per acre harvesting	13.6	22.7	20.8
Horse hours per acre harvesting	10.9	15.9	13.0
Truck hours per acre harvesting	.....	1.4	.....
Man hours per ton harvesting	6.2	6.7	7.7
Horse hours per ton harvesting	5.0	4.7	4.8
Truck hours per ton harvesting	.....	0.4	.....
Cost of harvesting per ton	$4.78	$4.76	$4.28

* Tons per acre of unhusked corn.

STRING BEANS

New York State leads in the production of string beans for the canning factory. The factories that pack beans are distributed thruout the State. The beans are grown for the most part on land operated by the canning companies. At Albion, in Orleans County, however, the canning company contracts with farmers for beans for canning. Accounts on their bean crop were kept by three farmers in this section in 1920. The average cost per acre of producing the crop on these farms in that year is given in table 83. Efficiency in the use of labor on these farms was probably higher than the average.

TABLE 83. AVERAGE COST OF PRODUCING AN ACRE OF STRING BEANS ON 3 FARMS IN ORLEANS COUNTY, GROWING 22 ACRES, IN 1920

Item	Quantity per acre	Cost per acre	Per cent of total cost
Seed	1.1 bu.	$ 8.64	14.3
Fertilizer	220 lbs.	3.34	5.5
Manure charged to string beans	1.8 tons	3.68	6.1
Labor growing string beans:			
Human	30.6 hrs.	13.18	22.0
Horse	40.5 hrs.	9.91	16.4
Use of equipment	40.5 hrs.	3.32	5.5
Use of tractor	2.7 hrs.	4.74	7.9
Interest on growing costs		0.48	0.8
Use of land		10.62	17.6
Total growing cost		$57.91	96.1
Labor harvesting string beans:*			
Human	2.1 hrs.	$0.95	1.6
Horse	4.2 hrs.	1.04	1.7
Use of equipment	4.2 hrs.	0.35	0.6
Total harvesting cost		$2.34	3.9
Total cost of crop		$60.25	100.0
Returns from crop	2,432 lbs.	$48.64	
Price per ton		$40.00	
Cost per ton growing		$47.63	
Cost per ton harvesting		1.92	
Total cost per ton		$49.55	

*No labor for picking the crop was included in the cost, as this was paid by the canning company. The farmer was required to haul the beans to the factory.

The price paid was 2 cents a pound. The average yield was 2432 pounds per acre. The variety was Refugee Wax. These fields were picked only once. After the first picking, disease developed, which spotted the pods and made them worthless for canning. Much better yields of beans have been obtained on these farms in previous years. Sometimes, after the beans

suitable for canning are all picked, a crop of ripe beans can be harvested for seed. The disease present in 1920 made this impossible on these farms.

LIMA BEANS

Lima beans are not grown extensively in New York. In northeastern Genesee County they are grown to be used by the local canning company. Accounts were kept by four farmers in this section on their lima-bean crop in 1920. The average cost of producing one acre of lima beans in 1920 on these farms is given in table 84. Efficiency in the use of man labor on these farms was probably higher than the average.

The labor growing lima beans was very similar to that on string beans except that less hoeing was done. The beans were harvested with bean pullers and drawn to the factory, where they were threshed. The roughage was kept by the factory.

TABLE 84. AVERAGE COST OF PRODUCING AN ACRE OF LIMA BEANS ON 4 FARMS IN GENESEE COUNTY, GROWING 12 ACRES, IN 1920

Item	Quantity per acre	Cost per acre	Per cent of total cost
Seed	0.6 bu.	$ 5.72	8.3
Fertilizer	17 lbs.	0.25	0.4
Manure charged to lima beans	4.1 tons	6.92	10.1
Labor growing lima beans:			
Human	23.0 hrs.	10.45	15.2
Horse	57.2 hrs.	14.00	20.5
Use of equipment	57.2 hrs.	4.69	6.8
Interest on growing costs		0.91	1.3
Use of land		10.25	15.0
Total growing cost		$53.19	77.6
Labor harvesting lima beans:			
Human	15.3 hrs.	$7.26	10.5
Horse	22.3 hrs.	5.46	8.0
Use of equipment	22.3 hrs.	1.83	2.7
Association charges		0.72	1.1
Interest on harvesting costs		0.07	0.1
Total harvesting cost		$15.34	22.4
Total cost of crop		$68.53	100.0
Returns from crop	1,290 lbs.	$77.41	
Price per ton		$120.00	
Cost per ton growing		$82.47	
Cost per ton harvesting		23.78	
Total cost per ton		$106.25	

PEAS FOR THE CANNING FACTORY

A blank for determininig the cost of production of and cultural data concerning peas for the canning factory.

Prepared by the Department of Agricultural Economics and Farm Management, and the Division of Vegetable Gardening (Department of Farm Crops) New York State College of Agriculture at Cornell University, Ithaca, N. Y.

Record for year..... County..... Farm No..... Tabulating No.....

Grower's name..... Post Office..... R. D.....

Canning factory..... Location of viner..... Distance to viner.....

Acres farmed..... Acres of peas planted..... Acres harvested.....

Labor on Peas for the Canning Factory

Operation	Dates	Hours						Tractor Auto Truck
		Total Human	Family		Hired		Horse	
			Operator		Man			
Plowing (Depth)								
Harrowing—spring tooth (t mes)								
Harrowing—spike tooth (times)								
Disking (times)								
Rolling or planking (times)								
Hauling fertilizer to farm								
Hauling fertilizer to field								
Hauling seed to farm								
Hauling seed to field								
Getting and applying inoculation								
Drilling (variety)								
Drilling (variety)								
Drilling (variety)								
Rolling after drilling								
Hauling and spreading manure (page 2)								
Hauling and spreading lime (page 2)								
Total—growing	X							
Rates per hour—growing	X							
Cost of labor—growing	X							
Harvesting (variety)								
Hauling (trips)								
Harvesting (variety)								
Hauling (trips)								
Harvesting (variety)								
Hauling (trips)								
Extra trips to town or factory about peas.								
Total—harvesting and marketing	X							
Rates per hour—harvesting and marketing	X							
Cost of labor—harvesting and marketing	X							
Total labor on crop	X							

Average length of time lost at viner per load of peas?

Kind of machine used for harvesting peas?

Acres of other crops mown with machine in 1920? Value $ Rate of depreciation %

Repairs purchased in 1920? $

Returns from Peas for the Canning Factory

Variety	Grade	Lbs. peas and vines	Lbs. shelled peas	Tons of shelled peas	Price	Value	Checks from Company	Value
							Date 1	
							2	
							Deduction for bu. seed	
Total								

Miscellaneous returns	Amount	Price	Value
Green vines fed or sold	tons		
Pea vine silage fed	tons		
Pea vine silage sold	tons		
Dry peas	bu.		
Straw from dry peas	tons		
Total	X	X	
Pea vine silage purchased	tons		

Disposal of pea vine silage		
Kind of stock	Av'g. No.	Days fed to
Dairy cattle		
Steers		
Sheep		
Lambs fattened		
Total fed		
Charge made by canner per ton?		

Average yields

Year	Acres	Yield per acre	Notes on variety, soil, weather, etc.
1920			
1919			
1918			
1917			
1916			
Average			

Causes of Loss in Yield

Description	Extent of loss	Control measures
Weather	tons	
Insects	tons	
Diseases	tons	
	tons	

Growers Experience with Varieties				**Crops 1920**	**Acres**
Variety	Yield	Uniformity of ripening			
				Beans	
				Peas	
Alaska				Tomatoes	
				Sweet Corn	
				Cabbage	
				Potatoes	
				Corn for grain	
				Corn for silage	
				Oats	
				Winter Wheat	
				Hay	
				Orchard	
				Total	

Rotation on Land in Peas for the Canning Factory

Year	Acres	Crop	Acres	Crop	Acres	Crop
1921						
1920	Soil type	Variety	Soil type	Variety	Soil type	Variety
1919						
1918						
1917						

Expenses on Peas for the Canning Factory

Seed	Variety	Acres Seed	Acres	Bu. per acre	Bushels	Price	Value
Total							

Fertilizer	Kind	Acres	Lbs. per acre	Pounds	Price	Value
Total						

Manure		Tons		Hours of Labor on Manure			% to	Tons to		
Year	Acres	per acre	Tons	Man	Horse	Truck	Crop	Crop	Price	Value
1920										
1919										
1918										
1917										
Total										

Lime			Tons		Hours of Labor on Lime			% to	Tons to		
Year	Acres	Kind	per acre	Tons	Man	Horse	Truck	Crop	Crop	Price	Value
Total											

Miscellaneous Expenses	Amount	Price	Value
Inoculation			
Total growing	X		
Total harvesting	X		

Use of Land for Peas

	Owned	Share	Cash	Total
Acres				
Value per acre	$	$	$	$
Total value	$	$	$	$
Annual cost in % of value	%	%	X	X
Rental for land in peas	$	$	$	$
Other expenses on rented land	X	X	$	$
Total charge for use of land	$	$	$	$
Peas intercropped in	Total acres		Equivalent acres	

For peas grown on shares record the tenant's and landlord's share of the following

	Tenant	Landlord
Seed		
Fertilizer		
Man Labor		
Horse Labor		
Equipment Costs		
Land Costs		
Peas		
Roughage		

Use of Buildings for Peas

Value	$
Per cent. of annual use for peas	%
Value of % used for peas	$
Annual cost in % of value	%
Charge for use of buildings	
What were buildings used for?	

Comparitive success of seedings with these crops of (if seedings with peas=100)			Hours required to fit an acre for wheat after these crops			Yields of wheat after these crops	Crop seeded in 1920 with peas?
Crop	Alfalfa	Timothy and clover	Man	Horse	Tractor		
Peas	100	100				bu.	
Barley						bu.	Rates of seeding?
Oats						bu.	
Wheat						bu.	
Beans	X	X				bu.	

What other farm operations did work on peas conflict with?

What crops have peas taken the place of in your rotation?

Summary—Costs and Returns

	Total		Per acre		Per ton	
	Amount	Value	Amount	Value	Amount	Value
Seed	bu.		bu.		bu.	
Fertilizer	lbs.		lbs.		lbs.	
Manure	tons		tons		tons	
Lime	tons		tons		tons	
Labor—growing	X	X	X	X	X	X
Total—human	hr.		hr.		hr.	
Horse	hr.		hr.		hr.	
Equipment	hr.		hr.		hr.	
Tractor	hr.		hr.		hr.	
Auto						
Truck						
Miscellaneous expenses—growing	X		X		X	
Interest on growing costs	X		X		X	
Use of land	acres		1 acre		acres	
Use of buildings	X		X		X	
Total cost—growing	X		X		X	
Labor—harvesting and marketing	X	X	X	X	X	X
Total—human	hr.		hr.		hr.	
Horse	hr.		hr.		hr.	
Equipment	hr.		hr.		hr.	
Auto						
Truck						
Miscellaneous expenses—harvesting and marketing	X		X		X	
Interest on harvesting and marketing costs	X		X		X	
Use of buildings	X		X		X	
Total cost—harvesting and marketing	X		X		X	
Total cost—crop	X		X		X	
Miscellaneous receipts	X		X		X	
Net cost of shelled peas	X		X		X	
Shelled peas sold to factory	tons		tons		1 ton	
Profit or loss	X		X		X	

Record taken by Date

Copied by Checked by

MAY 28 1926

JUL 10 1930